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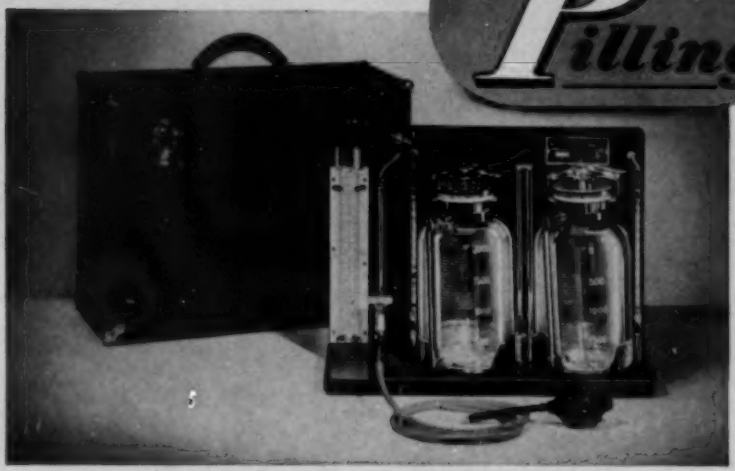

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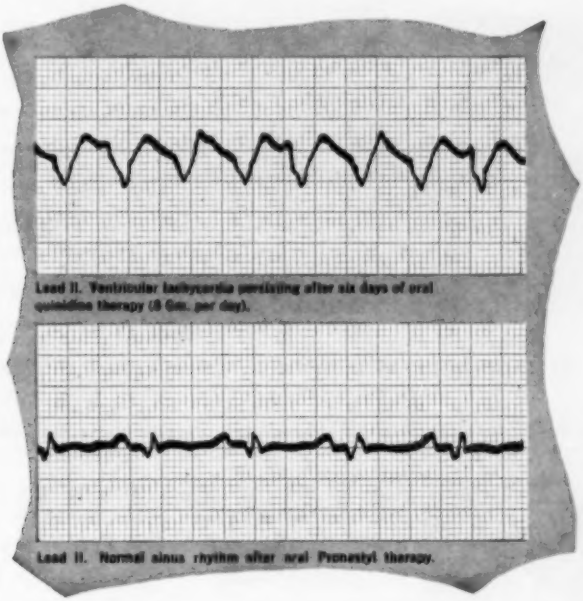

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OF THE

AMERICAN COLLEGE OF CHEST PHYSICIANS

EXECUTIVE OFFICE
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MURRAY KORNFELD, *Managing Editor*

VOLUME XX SEPTEMBER 1951 NUMBER 3

CONTENTS:

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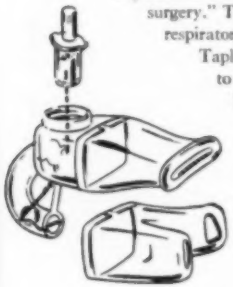

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1. Taplin, G., Cohen, S., and Mahoney, E. (1948), Prevention of Postoperative Pulmonary Infections, J. Amer. Med. Assn., 138:4, Sept. 4.

2. Krasno, L., and Rhoads, P. (1949), The Inhalation of Penicillin Dust; Its Proper Role in the Management of Respiratory Infections, Amer. Prac., 1:649, July.

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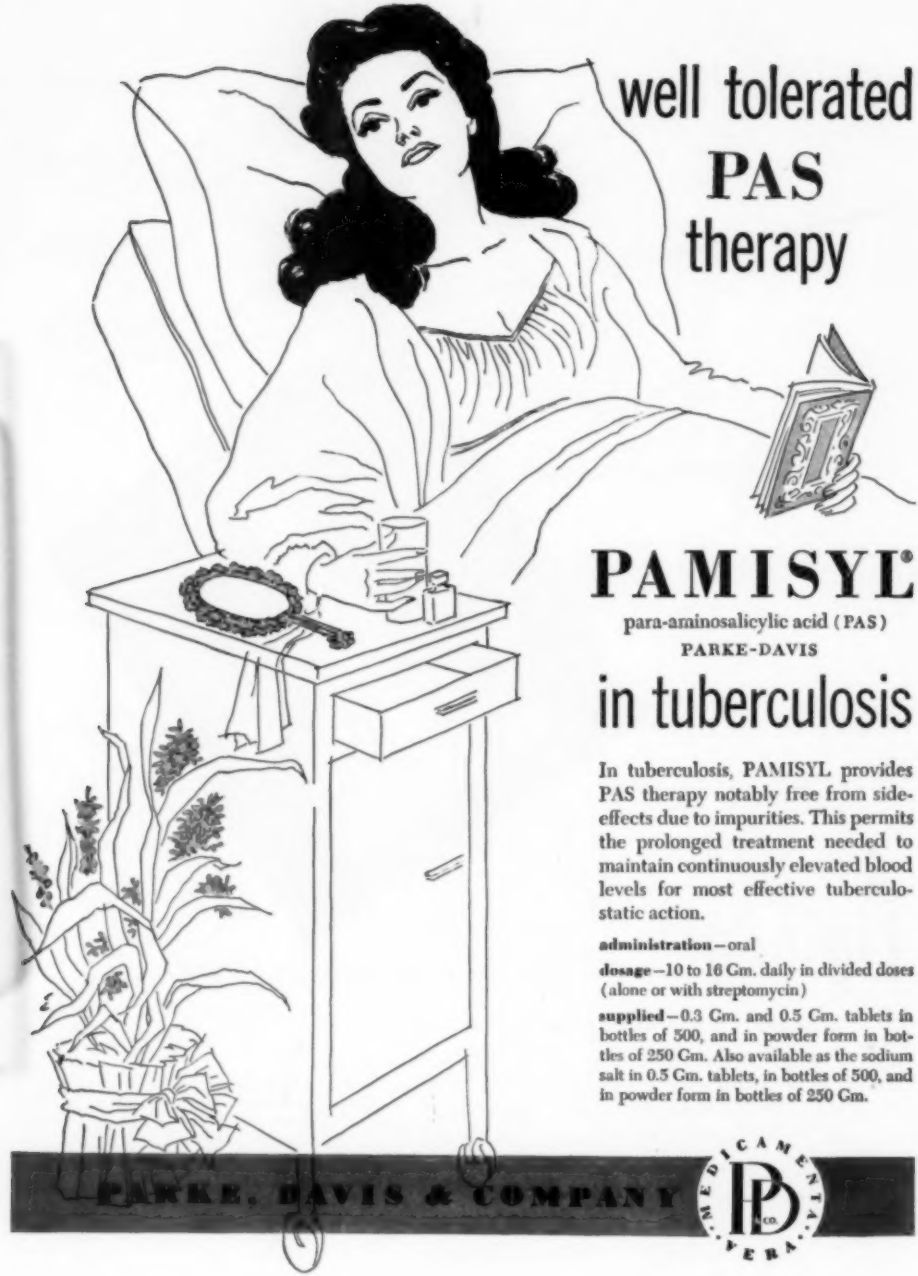

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DISEASES *of the* CHEST

VOLUME XX SEPTEMBER 1951 NUMBER 3

The Early Diagnosis of Primary Lung Cancer by Cytologic Methods*

SEYMOUR M. FARBER, M.D., F.C.C.P.,
ALLEN K. McGRATH, JR., M.D.,†
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and LLOYD W. ESPEN, M.D.†
San Francisco, California

The early diagnosis of primary lung cancer remains a problem to the clinician in spite of advances in diagnostic and surgical techniques during the past 17 years. Since 1946 a new technique—the diagnosis of cancer by cytologic methods—has been applied to patients with bronchogenic carcinoma.

The clinicians who utilize this procedure are interested primarily in it as a means of discovering carcinoma in more patients and at an earlier period. As with other malignancies, bronchogenic cancers may be cured only when diagnosis is early. Delay in diagnosis—whether due to the patient's fear or ignorance, to the physician's low index of suspicion or, possibly, to inadequate methods of diagnosis—contributes to the present high incidence of patients with lesions that are not amenable to surgical therapy.

The fatal delays attributed to inadequate diagnostic procedures interest us here. For many years, bronchoscopic examinations have been used to diagnose bronchogenic cancers without discovering a significant number of early, curable lesions. Some bronchoscopists state that "the higher the incidence of positive bronchoscopic biopsies, the lower the number of operable patients."[13] Overholt has stressed that surgical procedures could increase the

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†Trainee, National Cancer Institute.

Presented at the 16th Annual Meeting of the American College of Chest Physicians, San Francisco, California, June 24, 1950.

number of cured patients immediately and appreciably if diagnostic techniques were applied routinely to patients with minimal or no symptoms in the cancer age group.[8] A method of diagnosis which offers hope of increasing the incidence of patients sent to the surgeon with curable lesions is discussed here.

Cytologic Diagnosis

In the past three years, we have studied 6,281 specimens of sputum or bronchial secretions from 2,066 patients with benign and malignant diseases of the lungs. These individuals represent a diversified patient population from many institutions and hospitals and were studied when there was a clinical suspicion of malignancy, even if slight, in any patient with thoracic symptoms. Eighty-five per cent of all these patients were followed to a definite clinical or pathologic diagnosis. All were studied and diagnosed by the cytologist without knowledge of the clinical status of the patient on the basis of precise cellular criteria alone.

In our series, the diagnostic results on 241 patients with pathologically proved bronchogenic carcinoma indicated that when an adequate series of specimens was examined excellent case-finding accuracy was attained. A positive cytologic diagnosis was made in 55 per cent of these patients. When five or more sputum specimens were studied, an accuracy of 90 per cent was reached. At the same time, only two proved false suspicious diagnoses were made—these occurred in the first 500 patients studied.

The cytologic method is a sensitive and reliable procedure providing that an adequate number of specimens are examined by an experienced cytologist. Because this technique is simple and relatively inexpensive, it may be used on patients with minimal chest symptoms where laboratory facilities are available. A positive cytologic diagnosis is as reliable as a positive biopsy. It is an indication for exploratory thoracotomy, if made by a capable cytologist.[1,3]

The historical background of this method of diagnosis, the proper utilization of technical procedures, and the morphologic criteria for malignancy in smears has been discussed in detail in a previous publication.[1] The evaluation of cytologic techniques from the viewpoint of the cytologic diagnostician has been done by many investigators.[2,3,4]

Clinical Application of Cytologic Diagnosis

In order to clarify the role of this method in diagnosis, we are presenting from a clinical standpoint the experience in our cytology laboratory with 2,066 patients having varied pulmonary diseases.

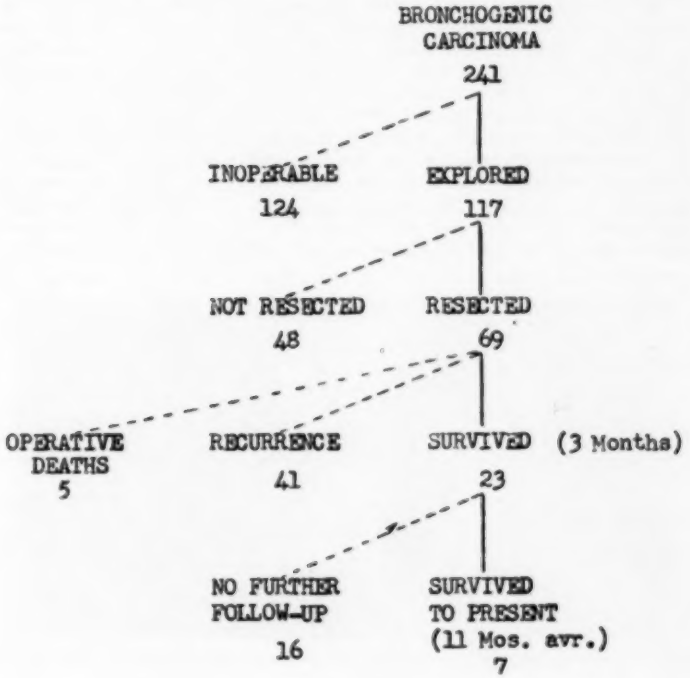
A) *Surgical patients:* Cytology is of great value to the thoracic

surgeon in establishing a preoperative morphologic diagnosis of cancer especially when such a diagnosis cannot be made by other means. Our experience with patients who were operated upon after cytologic studies is presented here. It is recognized that the ultimate value of cytologic techniques in the early diagnosis of primary lung cancer remains to be established by further investigative work.

The following illustration summarizes the surgical therapy on our patients with bronchogenic cancer (see Graph).

In the 117 patients who were operated upon, a positive cytologic diagnosis was the *first morphologic* evidence of cancer in 33; in 26 other patients it was the *only preoperative morphologic* evidence. Cytologic examinations were positive in 63 of these 117 patients; bronchoscopic biopsies were positive in 35 of the 117 patients.

In the 23 patients who survived pneumonectomy for more than three months, the cytologic diagnosis was positive in 11. In nine of the 11 patients, a positive cytologic diagnosis was the *only preoperative morphologic* evidence of cancer. The remaining 12



patients in this group surviving pneumonectomy were diagnosed as negative by *incomplete* cytologic studies. In the 23 patients, bronchoscopic biopsies were positive in four and a tumor was visualized in three additional patients.

The following case histories illustrate the value of cytologic diagnosis in establishing a preoperative morphologic diagnosis:

Case 1: A 61-year-old baker entered the hospital on June 9, 1948, because a routine chest x-ray film taken 10 days previously had revealed a density in the left lung (Figure 1). He had had a cough for two years, which was productive of morning sputum. On four occasions in the past year he had noted blood-streaked sputum. Also in the past year he had lost 40 pounds and noticed increasing weakness. Rales were present in the left hilar region posteriorly. A positive cytologic diagnosis was made on entry by examination of his sputum (Figure 2). On June 10, bronchoscopic examinations revealed a sanguinous exudate in the left lower lobe bronchus. Two days later a left pneumonectomy was performed and an epidermoid carcinoma of the left lung was removed. The patient is now well and at work 18 months after his operation.

Case 2: A 47-year-old carpenter entered the hospital on June 2, 1949, complaining of pain in the anterior portion of the left chest. This had been constant in nature for four months but now was associated with cough. At the onset of his illness, he had chills and a temperature to 103 degrees F. At this time (February, 1949), a chest x-ray film revealed a faint shadow in the left upper lung field (Figure 3). A low-grade fever and cough productive of two tablespoons of sputum daily had persisted to entry. An x-ray film taken at entry into the hospital showed a dense infiltration in the left upper lobe of the lung with questionable cavitation (Figure 4). There was marked wasting and a lag of the upper portion of the left chest. Decreased voice sounds, breath sounds and dullness to percussion were elicited in the left upper lung field. Early clubbing of his fingers was noted. The clinical diagnosis at entry was pulmonary tuberculosis with carcinoma to be ruled out. On June 10, malignant cells were found in his sputum (Figure 5). A bronchoscopic examination on

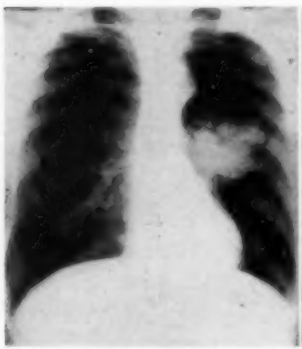


FIGURE 1

FIGURE 2

June 11 revealed a deformed carina. Malignant cells were demonstrated in bronchial aspiration smears. Ten days later the left upper lobe and lingula of the left lower lobe were removed. Pathologic study revealed a small epidermoid carcinoma of the left upper lobe bronchus. At present the patient has no evidence of recurrence.

B) *Peripheral lesions:* The clinician suspects carcinoma in many cases where the lesions are located in the periphery of the lung or in the upper lobe bronchi where bronchoscopic examinations are of limited value. Many of these conditions present diagnostic problems which could be solved by a definite morphologic diagnosis. It is in cases of this type that a positive cytologic diagnosis may prevent temporizing with a progressive disease.

In 60 patients in our series the lesion was demonstrated pathologically to be located in the peripheral or secondary bronchi. Of these patients, a positive cytologic diagnosis was made in 36, while in the 49 patients examined by the bronchoscopist no positive morphologic evidence of cancer was demonstrated (Table I).

TABLE I: PERIPHERAL LESIONS

	— — — CYTOLOGY — — —					
	Bronchial		Sputum		Bronchoscopy	
RIGHT:	Positive	2	Positive	15	Suspicious	5
	Negative	9	Negative	12	Negative	22
LEFT:	Positive	2	Positive	17	Suspicious	5
	Negative	9	Negative	11	Negative	17
TOTAL POSITIVE		4		32		0

The case of the following patient with a lower lobe lesion illustrates the usefulness of cytologic studies in establishing a definite diagnosis not obtainable by other procedures.

Case 3: A 77-year-old cook entered the hospital on December 19, 1949, complaining of weakness and a chronic productive cough of three years' duration. On entry his temperature was 102 degrees F. He had dullness to percussion, absent breath sounds, rales, and a pleural friction rub over the lower portion of the right chest posteriorly. A chest x-ray film showed an area of increased density and infiltration in the right lower lobe (Figure 6). A week after entry, a bronchoscopic examination was performed and a slight stenosis of the right lower lobe bronchus was found. No biopsy was taken. Two days later a positive cytologic diagnosis was made on cells found in his sputum (Figure 7). The clinical diagnosis at this time was primary lung abscess. On December 31, the tenth right rib posteriorly was resected and 20 cc. of purulent fluid was aspirated. On January 5, 1950, a segmental resection of the posterior portion of the right lower lobe was performed. The pathologic diagnosis was bronchiectasis. The patient expired on January 11, and an autopsy revealed a very

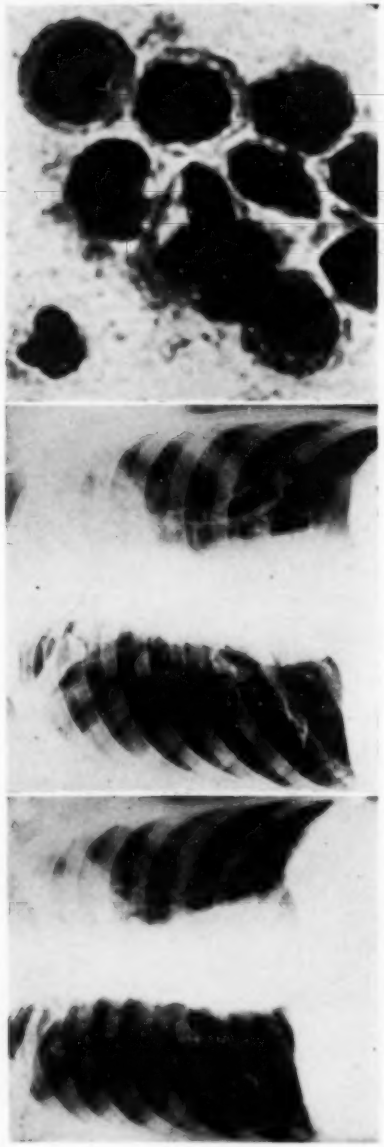


FIGURE 5

FIGURE 4

FIGURE 3

small (1 by 2 cm.) epidermoid carcinoma with a papillary projection into the right lower lobe bronchus (Figure 8). The mediastinal nodes were not involved.

C) *Diagnostic problems:* The clinical differential diagnosis on a number of our patients with bronchogenic carcinoma included many inflammatory diseases, such as tuberculosis, pneumonitis, primary lung abscess, coccidiodomycosis, etc. In many patients a benign pulmonary disease was the first clinical impression. It is well established that primary lung cancer may simulate closely the clinical and x-ray picture of benign inflammatory disease.[6] In nearly every patient in this group, multiple diagnoses were considered by the clinicians and roentgenologists. Tuberculosis was the first diagnosis in 30 cases; pneumonia in 10; primary lung abscess in 11; bronchiectasis in 3; and coccidiodal granuloma was considered a likely diagnosis in 3 cases. In about 50 per cent of all patients, the clinical diagnosis included a neoplasm *or* inflammatory disease in the diagnoses. In all cases where carcinoma was considered in the differential diagnosis, appropriate cytologic studies were requested.

The x-ray diagnoses were comparable to the above. The chest x-ray film showed a definite density in 41 patients (peripheral 78, hilar 63); atelectasis in 91; areas of infiltration in 45; pleural effusion in 35; and cavitation in 19 patients.

A positive morphologic diagnosis was established in many of these patients on the basis of positive cytologic studies alone. The case of the following patient illustrates a confusing clinical picture which was clarified by a positive cytologic diagnosis of malignancy:

Case 4: This 66-year-old pensioner entered the University of California Hospital on October 17, 1949, complaining of dyspnea and cough productive of slight amounts of sputum since 1942. He was diagnosed as having bronchial asthma. Six months before entry he lost weight and felt weak. He entered a local hospital where pulmonary tuberculosis was diagnosed on the basis of a single smear which demonstrated acid-fast organisms. Pneumoperitoneum was instituted. The patient was then referred to the University of California Hospital with a diagnosis of lung abscess, possibly due to a tumor. On examination, there was dullness to percussion, increased breath sounds, and wheezes posteriorly over the right lung field. A chest x-ray film revealed a thin-walled cavity in the right upper lobe and a right-sided aorta (Figure 9). Skin and serological tests for coccidioidomycosis were negative. A tuberculin skin test was positive 1:100. An echinococcus skin test was negative. Examinations for tubercle bacilli were negative. The clinical diagnosis was: 1) tuberculosis, 2) coccidioides, or 3) possibly lung abscess due to tumor. On October 27, a bronchoscopy was performed and revealed a normal bronchial tree. On November 2, malignant cells were found in the sputum (Figure 10). On the same day a second bronchoscopic examination was negative. On November 11, 1949, right pneumonectomy was performed. Pathologic examination revealed a small epidermoid carcinoma in a tertiary bron-

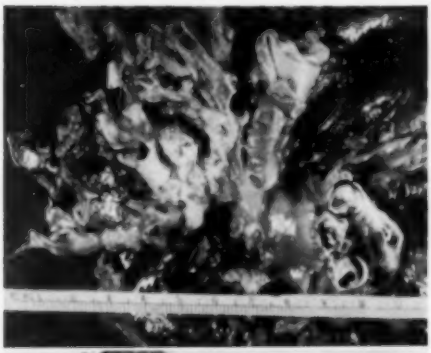


FIGURE 8

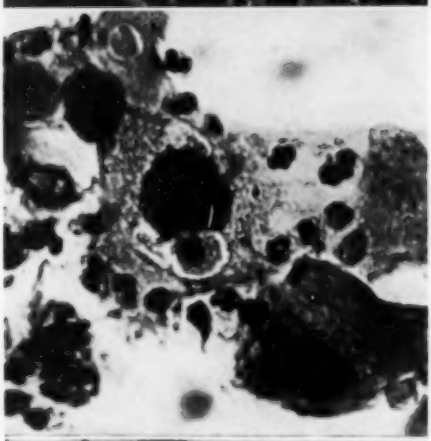


FIGURE 7

FIGURE 6

chus leading to the abscess cavity with distal atelectasis of the right lung. No metastases were demonstrated. After a stormy postoperative course, complicated by a bronchopleural fistula, the patient expired. At autopsy the cause of death was ascribed to a bleeding duodenal ulcer.

D) *Coexistent pulmonary tuberculosis:* Recent articles[9-11] have discussed the frequent association of bronchogenic carcinoma and pulmonary tuberculosis. Farber, et al.,[12] reported an incidence of 8 per cent of coexistent disease in 200 cases of bronchogenic carcinoma coming to autopsy. An increased awareness of the occurrence of pulmonary tuberculosis in the older, cancer-age group, together with advances in the surgery and chemotherapy of tuberculous patients, makes it essential that coexistent cancers be discovered early.

In many patients the clinical picture is obscured by the tuberculous process; in these instances cytology may be of great value. In our series of 241 patients with primary lung cancer, 12 had coexistent tuberculosis proved by pathologic studies. In an additional 10 patients the sputum showed acid-fast bacilli. In the pathologically proved cases (10 autopsies, two pneumonectomies) cytologic examination gave a positive diagnosis in nine; it provided the only premortem diagnosis in six.

The following patient had coexistent pulmonary tuberculosis and bronchogenic cancer of the left lung which was diagnosed before death by cytologic studies:

Case 5: A 51-year-old clerk entered the hospital in August, 1949. He complained of a productive cough, weakness, and dyspnea of two years' duration. He had noted blood-streaked sputum on several occasions. He had pleuritic chest pain and a 20-pound weight loss in the month prior to admission. On entry a temperature of 101 degrees F. was recorded and nonlocalized wheezes were elicited on examination of his chest. A chest x-ray film showed inflammatory disease in the left upper lung and pleural pericardial adhesions (Figure 11). Tubercle bacilli were demonstrated in his sputum on several occasions. A month after entry his chest x-ray film revealed an increase in the inflammatory disease in the left lung field (Figure 12). Sputum examinations on September 28 revealed malignant cells (Figure 13). In December, 1949, the patient expired. Subsequent autopsy revealed chronic pulmonary tuberculosis with cavitation and coexistent bronchogenic carcinoma in the left lung.

E) *Routine screening:* A promising application of cytologic studies is being carried out at the present time. In conjunction with a routine chest x-ray survey, examinations are being made of the sputum and bronchial aspirations of patients with chest lesions when malignancy is suspected. It is hoped that early cases with minimal symptoms will be discovered by the routine chest x-ray films and that cytologic techniques will be of aid in establishing a prompt diagnosis in many of these patients.

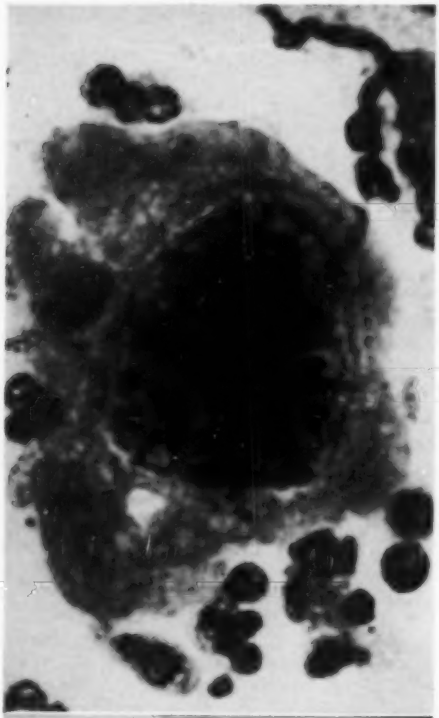


FIGURE 10

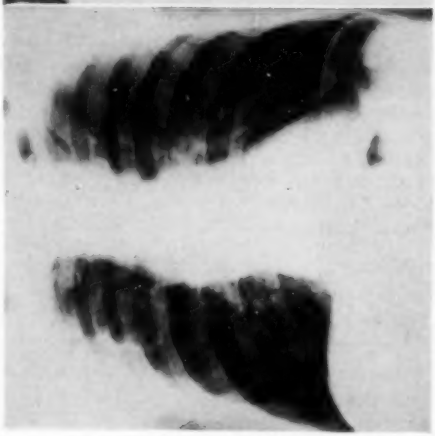


FIGURE 9

The use of cytologic techniques to screen patients in the cancer age group with pulmonary disease, whether carcinoma is suspected or not, is now being evaluated by this laboratory. Over four hundred patients with various diagnoses have been studied by routine examination of a single sputum specimen. Positive cytologic diagnoses have been made in three patients. One patient has refused to re-enter the hospital and another awaits pathologic proof of malignancy. The history of the third patient is given below:

Case 6: This elderly Chinese man entered a hospital on December 31, 1949, with vague complaints of pain in his chest of five days' duration. As nearly as could be determined through an interpreter, his only other symptom was a productive cough of five days' duration. He was dyspneic and had a temperature of 104 degrees F. on entry. Chest examination revealed a lag of the right chest and signs of consolidation over the right lower lobe. Microscopic examination of his urine revealed hematuria which persisted throughout his hospital stay. A chest x-ray film showed a patchy infiltration in the right lower lobe (Figure 14). The clinical impression was pneumonia, with tuberculosis to be considered. He was given penicillin and became afebrile a week after entry. Sputum examinations for acid-fast organisms were negative. On January 16, his chest film showed clearing of the infiltration in the right lower lobe (Figure 15). On the same day, as part of our routine screening of all patients with pulmonary disease, a single cytologic examination of his sputum was made. Malignant cells were found (Figure 16). On January 24, bronchoscopic examination revealed a small amount of blood in the right upper lobe bronchus. Cystoscopic examinations were non-contributory and the hematuria remained unexplained. Chest x-ray examination on January 25 showed right hilar adenopathy and residual infiltrations in the right lower lobe (Figure 17). On January 31, bronchoscopic re-examination revealed only injected membranes of the tracheo-bronchial tree. Bronchial smears were taken and cytologic study revealed no malignant cells. Repeated cytologic studies of the sputum consistently showed malignant cells of an epidermoid type (Figure 16). On February 13, after six weeks' of hospitalization, the patient was discharged to the out-patient clinic. An exploratory thoracotomy is being considered.

F) *Bronchogenic carcinoma (unconfirmed):* One hundred and twenty-one patients with bronchogenic carcinoma were diagnosed clinically in our series; and in these cases either no pathologic studies were made or biopsies were negative. None of these patients was considered amenable to surgical therapy. In 50 patients positive cytologic diagnoses established a diagnosis of malignancy and aided the clinician in determining prognosis and palliative therapy.

G) *Metastatic lung cancer:* One hundred and twenty patients with proved or clinically diagnosed lung cancer from various pathologically proved primary malignancies were in our series. In 22, malignant cells were demonstrated and served to establish a premortem diagnosis.

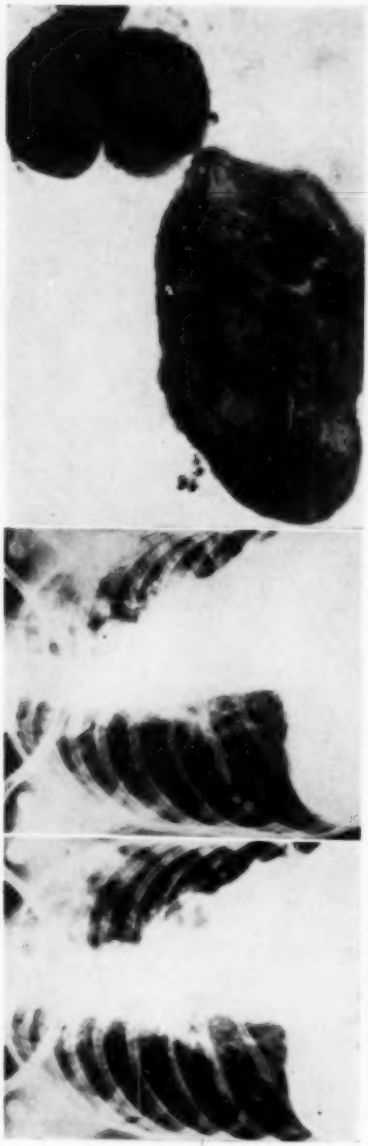


FIGURE 13

FIGURE 12

FIGURE 11

H) *Other malignancies:* Twenty-one patients with lymphoma were examined by cytologic techniques when the clinician considered bronchogenic carcinoma in the differential diagnosis. Forty-seven patients with nonpulmonary malignancy without demonstrable parenchymal or bronchial involvement were studied. In all these patients, the cytologic diagnosis was negative.

I) *Benign pulmonary diseases:* Included in the 2,066 patients studied by cytologic methods because malignancy was suspected were 1,208 patients with benign chest diseases. These various nonmalignant chest conditions included: pulmonary tuberculosis, 310 cases; various forms of pneumonitis, 240 cases; bronchiectasis, 84 cases; heart disease, 138 cases; and primary lung abscesses, 44 cases. Other miscellaneous conditions were: bronchitis, pulmonary infarct, bronchial asthma, emphyema, emphysema, benign neoplasms of the lung, etc.

In many of these patients, the clinical picture of lung carcinoma was simulated by benign pulmonary conditions, while in others the possibility of malignancy was remote. One patient with a primary lung abscess proved by lobectomy and one with chronic esophagitis and pneumonitis proved by autopsy had cells "suspicious for malignancy" reported present in their sputum early in our experience with cytologic diagnosis. Extensive follow-up of all patients to final clinical diagnosis has revealed two false positive diagnoses in the last 1,600 patients studied. With the exception of the two patients above, the remaining cytologic diagnoses in this group of patients were negative. Cells characteristic of other chest diseases, such as tuberculosis and bronchial adenomas, have not been observed by us.

It must be stressed that a negative cytologic diagnosis does not rule out lung cancer but must be carefully evaluated with other findings in the individual case. It has been determined that repeated cytologic examinations of five specimens or more increase the diagnostic accuracy to 90 per cent of cases with pathologically proved bronchogenic cancer. Thus, repeated examinations should be made while all other indicated diagnostic procedures are being carried out.

Discussion

In recent years, the numerous difficulties inherent in diagnosing carcinoma of the lung has been stressed by many workers. Early in the course of the disease the symptoms may be minimal in severity and confused with "cigarette cough," bronchitis, and other benign chronic chest conditions. A well-advanced bronchogenic carcinoma simulates other diseases, and accordingly, a positive diagnosis often cannot be made on the basis of clinical or

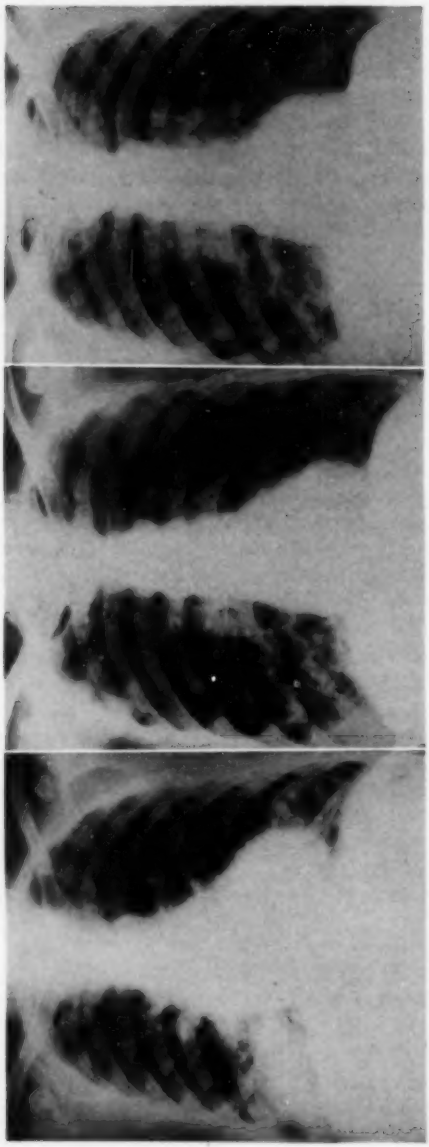


FIGURE 17

FIGURE 15

FIGURE 14

x-ray evidence. Overholt and Schmidt[8] found that the average patient had symptoms for 3.8 months before consulting a physician; an additional 1.6 months passed before the first x-ray film was taken; and an added period of 4.6 months passed before a pathologic diagnosis was finally made.

Since most thoracic surgeons prefer an explicit preoperative diagnosis, morphologic evidence is desirable in order that patients with curable bronchogenic carcinoma may reach the operating table at an early time. Since a positive cytologic diagnosis has been proved to be reliable morphologic evidence of lung cancer, the clinical utilization of the method in relation to other diagnostic procedures will be analyzed in our series of patients:

In every case in this series of 241 patients, the clinician ordered cytologic studies *after* a suspicion of cancer was gained by clinical and x-ray studies. In seven instances, the patients were first examined after pulmonary lesions suspicious for neoplasm were demonstrated by a routine chest roentgenogram. None of the cases studied by routine application of cytologic techniques are included in this group of 241 pathologically proved bronchogenic cancers.

The relationship of positive cytologic diagnosis to other ordinary pathologic methods of establishing a morphologic diagnosis is presented below. In those cases where a positive cytologic diagnosis was the first morphologic evidence of cancer, the average time

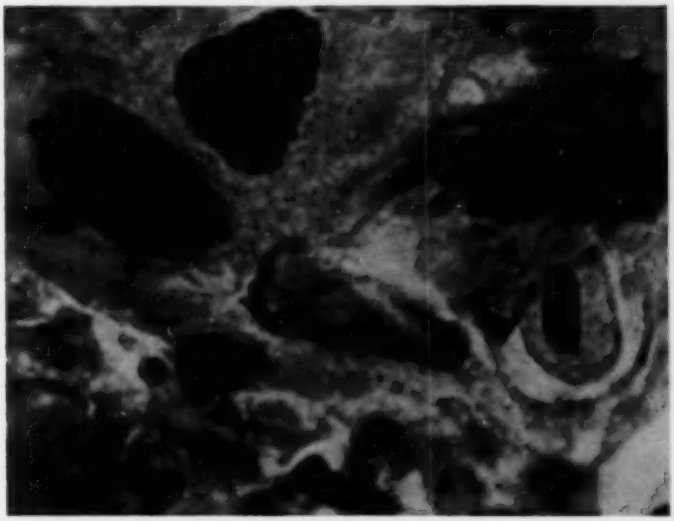


FIGURE 16

lapse before tissue section proof was two and one-half weeks. In 12 cases, cytologic diagnoses were the *only* positive premortem diagnosis.

TABLE II: CYTOLOGIC DIAGNOSIS

First morphologic diagnosis	47 per cent
Coincident morphologic diagnosis	46 per cent
Reported after other morphologic diagnosis	7 per cent

The clinical application of cytologic diagnosis to the detection of bronchogenic cancers at an earlier stage of their growth has been discussed. At present these techniques, if applied properly, make it possible to diagnose accurately a large number of cases of primary lung cancers. *Earlier diagnoses will be made* when these procedures are applied immediately after a clinical suspicion of cancer is gained. *Earlier diagnoses will be made* when this diagnostic method is utilized on patients with suspicious chest lesions detected by routine chest x-ray film surveys. *Earlier diagnoses will be made* when patients with any pathologic chest conditions—whether cancer is suspected or not—are routinely examined by cytologic methods. The clinician will realize that these methods of application should yield a number of diagnoses on patients with curable lesions.

The ultimate limitations of cytologic diagnosis of curable lung cancer may be questioned. As has been repeatedly demonstrated, carcinoma of the cervix may be detected in situ and at very early stages of growth by cytologic studies.[14,15] Investigative work by Appel and Bronk has suggested that very early lesions of bronchogenic cancer exfoliates cells which may be detected by cytologic methods.[16,17] These authors transplanted Brown-Pierce carcinomas of the testes into the lungs and bronchial tree of rabbits. Swabs were introduced into the trachea of these animals and cytologic studies were made of the bronchial secretions so obtained. In 58 per cent of the rabbits, malignant cells were found on the sixth day. By the end of the third week, 100 per cent were positive. In order to correlate the appearance of tumor cells in the bronchial secretions with the appearance of grossly recognizable tumors in the lung, the animals were sacrificed as soon as positive bronchial smears were obtained. In none of the animals showing tumor cells in the bronchial secretions at six days could tumor be recognized grossly, but small nodules of tumor could be demonstrated microscopically. The earliest time at which a tumor could be recognized grossly was 10 to 20 days following transplantation.

In conclusion, we believe that early diagnosis of lung cancer can be achieved by cytologic techniques as soon as this procedure is immediately applied to all patients suspected of having carcinoma,

to patients with equivocal lung lesions detected by routine chest film surveys, and as a routine screening procedure to selected patients with cough and sputum. There is little theoretical limitation to the diagnosis of very early malignant lesions by cytologic examinations of sputum and bronchial secretions.

SUMMARY

1) Six thousand two hundred and eighty-one specimens of sputum or bronchial secretions from 2,066 patients were studied by cytologic techniques. Two hundred and forty-one patients had bronchogenic cancer diagnosed by pathologic studies.

2) A positive cytologic diagnosis was made in 55 per cent of these 241 patients. When five or more sputum specimens were examined, the accuracy rose to 90 per cent.

3) The clinical applications of cytologic diagnostic techniques are discussed:

a) Cytology is of value to the thoracic surgeon in establishing a reliable preoperative morphologic diagnosis of lung cancer.

b) A positive cytologic diagnosis may be made in many cases where the lesions are located in the periphery of the lung or upper lobe bronchi where bronchoscopic examinations are of limited value.

c) Difficult diagnostic problems may be solved when a definite morphologic diagnosis of cancer is made by positive cytologic studies.

d) In patients with coexistent pulmonary tuberculosis and bronchogenic carcinoma, cytologic studies may clarify a confusing clinical picture.

e) Cytologic studies of sputum may be utilized as routine screening procedures on patients with minimal or no pulmonary symptoms.

4) In our series of pathologically proved bronchogenic cancer, a positive cytologic diagnosis was made oftener and sooner than other morphologic diagnoses. In 47 per cent of these cases cytology was the first diagnostic procedure to establish a morphologic diagnosis.

5) *Earlier diagnoses will be made* when cytologic techniques are applied immediately after cancer is suspected.

6) *Earlier diagnoses will be made* when this diagnostic method is utilized on patients with equivocal lung lesions detected by routine roentgen surveys.

7) *Earlier diagnoses will be made* when patients with cough and sputum—whether cancer is suspected or not—are routinely studied by cytologic techniques.

RESUMEN

1) Se estudiaron mediante técnicas citológicas 6,281 espécimenes de esputo o de secreciones bronquiales de 2,066 pacientes. Doscientos cuarenta y un pacientes tenían cáncer broncógeno diagnosticado por estudios patológicos.

2) En el 55 por ciento de esos 241 pacientes se hizo un diagnóstico citológico positivo. Cuando se examinaron cinco o más espécimenes de esputo, la exactitud ascendió al 90 por ciento.

3) Se discuten las aplicaciones clínicas de las técnicas del diagnóstico citológico:

a) La citología es de valor al cirujano del tórax en establecer un diagnóstico morfológico preoperatorio confiable de cáncer pulmonar.

b) Se puede hacer un diagnóstico citológico positivo en muchos casos en los que las lesiones están situadas en la periferia del pulmón o en los bronquios de los lóbulos superiores, en los que los exámenes broncoscópicos son de valor limitado.

c) Se pueden resolver difíciles problemas diagnósticos cuando se hace un diagnóstico morfológico bien definido de cáncer mediante estudios citológicos positivos.

d) En pacientes en los que coexiste la tuberculosis pulmonar y el cáncer broncógeno, los estudios citológicos pueden clarificar un cuadro clínico confuso.

e) Pueden utilizarse los estudios citológicos del esputo como procedimientos rutinarios en pacientes con síntomas pulmonares o mínimos o ausentes.

4) En nuestra serie de cánceres broncógenos comprobados patológicamente, se hizo un diagnóstico citológico positivo más frecuente y tempranamente que otros diagnósticos morfológicos. En el 47 por ciento de estos casos la citología fue el primer procedimiento diagnóstico que estableció el diagnóstico morfológico.

5) *Se harán diagnósticos más tempranos* cuando se apliquen las técnicas citológicas a penas se sospeche el cáncer.

6) *Se harán diagnósticos más tempranos* cuando se utilize este método diagnóstico en pacientes con lesiones pulmonares equívocas descubiertas en catastros roentgenográficos rutinarios.

7) *Se harán diagnósticos más tempranos* cuando se estudie rutinariamente, mediante técnicas citológicas, a pacientes con tos y esputo, ya se sospeche o no el cáncer.

RESUME

1) Six-mille-deux-cent-quatre-vingt-un échantillons de crachats ou de sécrétions bronchiques provenant de deux-mille-soixante-six

malades ont été étudiés au point de vue cytologique. Chez deux-cent-quarante-et-un malades, on constata anatomiquement l'existence d'un cancer bronchique.

2) Chez ces deux cent quarante et un malades, un diagnostic histologique put être fait dans 55% des cas. Quand on examina pour un malade au moins cinq échantillons de crachats, les résultats positifs s'élevèrent à 90%.

3) L'auteur discute les applications cliniques de l'examen cytologique des crachats:

a) La cytologie a une grande valeur pour le chirurgien thoracique et permet de faire un diagnostic pré-opératoire du cancer du poumon.

b) La cytologie permet le diagnostic dans bien des cas où les lésions sont situées à la périphérie du poumon ou à l'extrême sommet, régions où un examen bronchoscopique n'a qu'une valeur limitée.

c) L'examen cytologique, quand il permet le diagnostic du cancer donne la solution du problème des diagnostics difficiles.

d) Quand, chez un malade, co-existent une tuberculose pulmonaire et un cancer bronchique, l'examen cytologique apporte de la clarté à un tableau clinique confus.

e) L'examen cytologique des crachats doit être utilisé systématiquement chez les malades qui n'ont que des symptômes pulmonaires minimes ou même inapparents.

4) Dans nos séries de cancers bronchiques démontrés anatomiquement, c'est l'examen cytologique qui permit le plus souvent et le plus rapidement de faire le diagnostic. Dans 47% de ces cas, l'examen cytologique fut le procédé qui permit de suspecter les lésions.

5) Le diagnostic sera plus précoce quand on appliquera systématiquement l'examen cytologique après toute suspiscion de cancer.

6) Le diagnostic sera fait plus précocément lorsque cette méthode de diagnostic sera appliquée au malade atteint de lésions pulmonaires imprécises, découvertes lors d'examens systématiques.

7) Le diagnostic plus précoce sera fait quand, chez des malades atteints de toux et d'expectoration, que le cancer soit suspecté ou non, l'examen cytologique sera fait systématiquement.

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Carcinoma of the Lung: Duration of Life of Individuals Not Treated Surgically*

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The belief is widespread that individuals with untreated primary carcinoma of the lung seldom live longer than two years. The two-year "death sentence" is used by many as a deciding factor in differential diagnosis, disease of longer duration being presumed nonmalignant. Current views respecting the comparatively short life of individuals with bronchiogenic carcinoma stem largely from observations of thoracic surgeons of patients whose disease for one reason or another cannot be treated surgically. But inasmuch as patients not subjected to operation are more apt to have advanced disease, this group cannot be used as a gauge of the average survival of all patients with bronchiogenic carcinoma. For the same reason the duration of life of nonoperated patients cannot be used as a yardstick of the results of resectional surgery.

This study was undertaken in the hope of obtaining additional information on a subject which is becoming increasingly important as more individuals are being discovered with bronchiogenic carcinoma and greater numbers subjected to surgery. Montefiore Hospital, New York City, where this study was made, admits patients with chronic diseases usually in advanced stages and the period of waiting to the wards is often long. As a result, a variable number of individuals with acutely progressive disease succumb either at home or in general hospitals before they have an opportunity to enter this institution. In evaluating the results of our study, this factor should be taken into consideration.

Between 1914 and 1949, 952 patients with primary carcinoma of the lung were treated at the Montefiore Hospital. The material was analyzed and divided into two groups: (1) Two hundred and six patients treated between 1914 and 1932; and (2) Seven hundred and forty six patients treated between January 1932 and July 1949. The latter group included 443 patients with disease verified by postmortem examination (330), bronchoscopic biopsy or other

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histological proof (113). The statistical data is based on an analysis of this group of patients. The 1914-1932 group was excluded from the study because of the possibility that instances of bronchial adenoma or benign tumors might have been included. It is noteworthy, however, that in 1932 one of the authors[1] had occasion to analyze this group of patients and the over-all statistics respecting the longevity of individuals with bronchiogenic carcinoma not treated surgically were almost identical with those obtained in the present study.

Duration of Life From Time of Onset of Striking Symptoms

As shown in Table I, of 443 patients with proved bronchiogenic carcinoma, 220 (49.6 per cent), or almost half, died within one year of the onset of striking symptoms. The latter included hemoptysis, chest pain, excessive loss of weight in a short time, fever and other evidence of infection or symptoms referable to metastatic involvement. History of cough, expectoration and moderate loss of weight was not considered definitive unless associated with one or more of the symptoms mentioned above. Obviously, our estimation of the symptomatic stage of the disease did not take into consideration a variable interval during which patients had

TABLE I

Duration of Life of 443 Patients with Carcinoma of Lung Not Treated Surgically

Duration in Months	From Onset of Striking Symptoms	Per cent	From First Objective Findings	Per cent
			Diagnosis not Made During Life — 11	2.5
0-5	58	13.1	183	41.3
6-11	162	36.5	135	30.5
12-17	103	23.3	56	12.6
18-23	50	11.3	29	6.5
24-35	45	10.2	15	3.4
36-47	12	2.7	8	1.8
48-59	6	1.3	3	0.7
60-71	3	0.7	2	0.5
72-83	3	0.7	1	0.2
84-89	1	0.2	0	0.0
TOTAL	443	100.0	443	100.0

few or no complaints. Since in a number of the patients the carcinoma was associated with pulmonary fibrosis, bronchiectasis or tuberculosis, which may have antedated the neoplasm, it seemed preferable to trace the onset of the carcinoma to the time of appearance of striking symptoms.

An additional 153 patients (34.6 per cent) had striking symptoms for a period of one to two years before succumbing to the disease. In all, eight of every 10 patients died within two years of the appearance of striking symptoms. Equally impressive, however, was the finding of 70 individuals, or slightly more than 15 per cent, who lived for two to as long as seven-and-a-half years. This number included 18 patients who lived three to five years and seven who lived five years or longer. One patient is still alive and another, not included in the compilation, lived so long that inclusion of this case would have weighed too heavily in the statistical findings (see case report).

The average duration of life of the 443 patients from the time of onset of striking symptoms was 14.2 months. This figure agrees closely with that of Tinney[2] who in a study of 315 patients found the average duration of life from the time of onset of symptoms 14.5 months. Ariel and associates[3] found the duration of life in 217 patients with histologically proved bronchiogenic carcinoma from the time of onset of symptoms to be 11.9 months.

Duration of Life From First Objective Findings

In 11 instances (2.5 per cent) the carcinoma was first discovered postmortem. Of the remainder, 318 (71.8 per cent) lived less than one year and 85 (19.1 per cent) one to two years from the time objective findings were discovered either roentgenologically, on bronchoscopy, biopsy and/or other means of investigation. Nine of every 10 individuals, therefore, died within two years of the finding of objective evidence of disease. Twenty-nine patients (6.6 per cent) lived from two to as long as seven years. The average duration of life of the 443 patients from the time of discovery of objective findings was 9.1 months (Table I). Tinney[2] found the average duration of life of 315 patients with bronchiogenic carcinoma from the time of diagnosis, six months. Ariel and associates,[3] in a collected report, found that 527 untreated patients with bronchiogenic carcinoma had an average life of 6.2 months from the time of diagnosis. The somewhat longer survival time of the Montefiore group of patients is partly explained by the fact that the more chronic type of disease is treated in this institution, as well as the fact that the diagnosis was not made in many instances in spite of the presence of abnormal findings. The significance of the latter could be appreciated only in retrospect.

Interval Elapsing Between the Onset of Striking Symptoms and Discovery of Objective Findings

Of greatest importance from a clinical standpoint is the time elapsing between the appearance of symptoms and the recognition of disease. Unfortunately, our studies do not permit reliable conclusions on this point because it was most difficult to determine in any individual the exact time when the diagnosis had been made. The average interval between the onset of striking symptoms and the finding of pulmonary disease, sooner or later proved carcinoma, was 5.1 months. Lindskog and Bloomer[4] found the average duration of symptoms of 200 patients prior to their first hospital admission, 7.9 months. These authors observed a phenomenon which seemed off-hand rather paradoxical, namely, their inoperable patients had symptoms over a somewhat shorter period of time than those with resectable lesions. Overholt and Schmidt[5] likewise found the percentage of survivors among their patients submitted to resection to be lower in the ones who had symptoms less than six months as compared to those who had symptoms six to 12 months. Adams,[6] also Lambert[7] cite similar experiences. The significance of these observations will be discussed later.

Relation of Type of Carcinoma to Duration of Life

There is general agreement that resectional surgery offers the best prospects of success in patients with epidermoid carcinoma, and the worst in those with anaplastic carcinoma. Histological study of sections of 320 patients examined at autopsy, in which a differentiation of tissue type was possible (Table II), revealed that the average length of life from the onset of striking symptoms was longest (14.1 months) in 122 patients with epidermoid carcinoma and shortest (11.4 months) in 72 with anaplastic carcinoma, the adenocarcinoma group (126 patients) occupying an intermediate position (13.6 months). Broken down to shorter survival periods, as shown in Table 2, it is evident that patients with anaplastic carcinoma die at a much faster rate than do those with other forms of malignancy. Koletsky,[8] also Gebauer,[9] made similar observations. Among 19 patients who lived three years or longer, in whom an histological differentiation of the tumor was possible, nine had epidermoid carcinoma, eight adenocarcinoma and two anaplastic carcinoma.

The average duration of life from the time of discovery of objective findings was 9.2 months in the group with epidermoid carcinoma, 8.1 months in the group with adenocarcinoma, and 8.4 months in the group with anaplastic carcinoma. The variations between groups are not striking. The fatality rate within indi-

vidual groups, however, is precipitous especially in patients with anaplastic carcinoma. Apparently, by the time the carcinoma is discovered the type does not influence greatly the natural span of life; the damage had already taken place. As mentioned previously, the type of tumor has an important bearing on prognosis following resection, the chances of longer survival being greater in patients with epidermoid carcinoma and less in those with the more rapidly metastasizing anaplastic carcinoma.

Bronchiogenic Carcinoma of Long Duration

Particular attention was paid to a group of 26 patients with bronchiogenic carcinoma of three years' duration or longer, a period of survival seldom associated with this disease. Fried,[10] also Goldman[11] are among the few who have written on the subject. The present series of cases included 18 who lived three to five years and eight, five to more than eight years (one of the latter is still alive) Table III. The average survival period of the entire group was more than 52 months from the time of occurrence of striking symptoms and more than 34 months after the discovery of objective findings. Excepting for the fact that this group included a larger number of patients with epidermoid carcinoma, as might be surmised, no other significant factors were found to account for the comparatively longer duration of life of

TABLE II

Relation of Type of Carcinoma to Duration of Life

From Symptoms

TYPE	No.	0-11 Mos. No.	0-11 Mos. Pct.	12-23 Mos. No.	12-23 Mos. Pct.	24 Months and Over No.	24 Months and Over Pct.	Average Months
Epidermoid	122	57	(46.7)	47	(38.5)	18	(14.8)	14.1
Adenocarcinoma	126	61	(48.4)	50	(39.7)	15	(11.9)	13.6
Anaplastic	72	47	(65.3)	18	(25.0)	7	(9.7)	11.4
TOTAL	320	165	(51.6)	115	(35.9)	40	(12.5)	

From Objective Findings

TYPE	No.	0-11 Mos. No.	0-11 Mos. Pct.	12-23 Mos. No.	12-23 Mos. Pct.	24 Months and Over No.	24 Months and Over Pct.	Average Months
Epidermoid	122	85	(69.7)	30	(24.6)	7	(5.7)	9.2
Adenocarcinoma	126	95	(75.4)	25	(19.8)	6	(4.8)	8.1
Anaplastic	72	62	(86.1)	7	(9.7)	3	(4.2)	8.4
TOTAL	320	242	(75.6)	62	(19.4)	16	(5.0)	

TABLE III: BRONCHIOGENIC CARCINOMA OF LONG DURATION

Case No.	Hospital No.	Name	Sex	Age	Symptoms	Duration of Life from Onset of Striking Symptoms, Months	Earliest X-Ray Findings Prior to Death, Months	Earliest Bronchoscopic Findings Prior to Death, Months	Other Microscopic Findings	Duration of Life From Objective Findings, Months
1	23871	M.L.	M	55	Cough, hemoptysis	63	54 Infiltration left lung	13 Mass between left upper and left lower bronchi, compressing both	Biopsy revealed carcinoma	51
Postmortem Findings: Anaplastic Carcinoma left hilum arising from left main bronchus. Large abscess cavity. No metastases to regional lymph nodes. No extrathoracic metastases.										
Comment: Considered at first to have pulmonary neoplasm. Because of a negative bronchoscopy diagnosis of pulmonary tuberculosis entertained for a time. No evidence of tuberculosis found postmortem.										
2	21289	T.F.	M	66	Cough, loss weight, dyspnea	69 or more	69 Mass upper portion of left chest			69
Postmortem Findings: Anaplastic Carcinoma: Large necrotic tumor mass replacing upper lobe. Tuberculous bronchopneumonia with cavitation. Adenocarcinoma of prostate histologically differing from the pulmonary neoplasm. Multiple polyps of colon with malignant transformation of one polyp.										
Comment: Three independent neoplasms; carcinoma of the lung, prostate, and polyp of colon with malignant transformation. Terminal tuberculous pneumonia.										
3	17421R	A.F.	M	61	Cough, hemoptysis, pain	70	64 Shadow in right lung from apex to fourth rib	Four bronchoscopic examinations—negative	Aspiration biopsy of right lung 5 years prior to death showed tumor	65
Comment: Two years prior to death metastases to scapula, clavicle, left lung and ribs with pathological fracture of 4 ribs.										

4	22134	B.K.	M	52	Cough, hemoptysis, hoarseness	72	37 Left pleural effusion. 31 Metastatic nodules in right lung	Negative on one occasion	Resection of rib and biopsy revealed carcinoma of lung	37
Comment: Thoracotomy for empyema revealed carcinoma.										
5	21834 (FIGURE 2)	J.Y.	M	31	Hiccoughs	72	72 Circumscribed mass above right leaf of diaphragm	Negative		72
Postmortem Findings: Adenocarcinoma right lower lobe constricting bronchus. Neoplasm extended to diaphragmatic surface of right lung. Limited involvement of left lung and regional lymph nodes. No extrathoracic metastases. *Comment:* Initial hiccoughs due to irritation of diaphragm by tumor. Development of carcinoma followed roentgenologically for 6 years until death.										
6	46576 (FIGURE 3)	J.L.	M	55	Hemoptysis, pain	74	27 Density right upper lobe	Negative	Aspiration of mass in neck revealed metastatic carcinoma	27
Postmortem Findings: Epidermoid carcinoma right upper lobe with invasion to neck, chest wall, trachea and esophagus; generalized metastases. *Comment:* Recurring hemoptyses for 4 years before seeking treatment. Sputa repeatedly negative for acid-fast organisms.										
7	31462	B.G.	F	42	Recurring hemoptyses	84	36 Density left hilum. Later pleural effusion	84 Healed ulceration, left upper lobe bronchus	Tumor cells in pleural fluid	36
Postmortem Findings: Epidermoid carcinoma of left bronchus with collapse and fibrosis of left lung. Metastases to left pleura, parietal pericardium, mediastinum, diaphragm, right lung, regional nodes, left adrenal. *Comment:* Recurring hemoptyses at which time bronchoscopy revealed healed ulcer left upper bronchus. Four years later, left hilar mass found. Course of disease characterized by recurring hemoptyses.										
8	45485 (FIGURE 4)	M.B.	M	54	Cough, fever	89	48 Mass right upper lobe	Epidermoid carcinoma		65
Comment: Considered to have fungus disease of lungs for 5 years. Finally bronchoscopy showed carcinoma. Exploratory thoracotomy revealed epidermoid carcinoma of right upper lobe bronchus. Alive at time of writing.										

these individuals. Autopsy often disclosed disease limited to the thoracic contents, but this is to be expected since otherwise death would have occurred much sooner. It is well to bear in mind, therefore, that in occasional instances bronchiogenic carcinoma pursues a relatively chronic course, as strikingly exemplified by the following instance.

J. S., a man of 50 years was found to have an epidermoid carcinoma of the right lung proved by bronchoscopic biopsy. He lived 17 years, the neoplasm remaining under control, except for evidence of vertebral metastasis discovered 13 years after the onset of the disease. The patient died of heart failure at the age of 67.

He was first seen at the Memorial Hospital, New York City, in October 1932, at which time he complained of cough, hemoptysis, expectoration, wheezing and pain in the right chest. He was admitted to the Memorial Hospital in December 1933 and examination revealed disease of the upper lobe which was believed to be either abscess or tuberculosis. Repeated examinations of the sputum failed to reveal acid-fast organisms. Because of recurring hemoptyses, bronchoscopy was done. It revealed at the entrance of the right middle lobe bronchus an area of blood and granulation. The biopsy specimen was reported as showing epidermoid carcinoma, Grade II. The histological diagnosis, we learn, was made by the late Dr. James Ewing and the slide reviewed by Dr. Fred Stewart in August 1943, who reconfirmed the diagnosis. Through the courtesy of Dr. Stewart one of us (R.L.) had an opportunity to examine the slide.

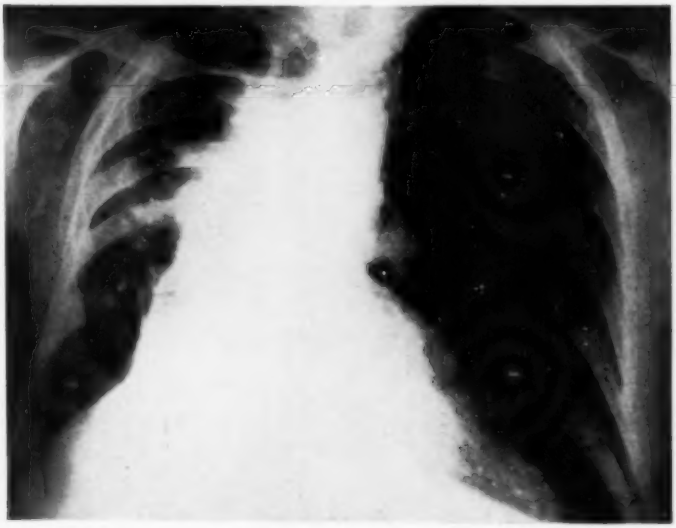

FIGURE 1 (Case J.S.): Roentgenogram reveals marked shrinkage and fibrosis of right lung; thickened pleura. Heart, mediastinum and trachea displaced to right.

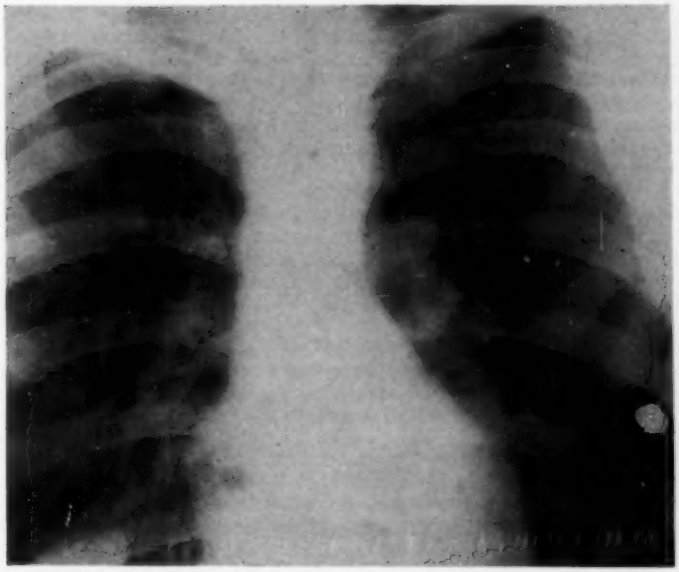

FIGURE 2 (Case 5, J. Y.): Roentgenogram reveals circumscribed density above right leaf of diaphragm. Courtesy, Dr. B. M. Fried.

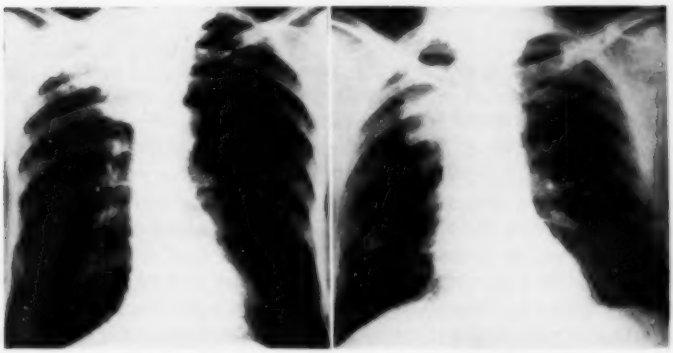

FIGURE 3 FIGURE 4

Figure 3 (Case 6, J. L.): Roentgenogram reveals irregular density in right upper lobe. — *Figure 4 (Case 8, M. B.):* Roentgenogram reveals circumscribed density in right upper lobe.

The patient was treated with radiotherapy. After six months, his condition improved and he was followed at irregular intervals thereafter. During this time, he had slight cough, occasional hemoptysis, moderate pain in the chest and frequent respiratory infections. Roentgen examination of the chest at the Memorial Hospital in February 1945, revealed evidence of radiation reaction in the right upper lobe with retraction of the mediastinum and heart to the right, elevation of the right leaf of the diaphragm and localized emphysema. Roentgen examination of the spine, at this time, disclosed a compression deformity of the 10th dorsal vertebra.

In the fall of 1945, he was admitted to the Morrisania City Hospital on three separate occasions for treatment of acute seizures of dyspnea and orthopnea. These were ascribed to transient episodes of heart failure. On one occasion, in November 1945, 1100 cc. of serosanguinous fluid were removed from the left pleural cavity. No tumor cells were found in the specimen. Repeated roentgen examinations of the chest revealed the same picture of fibrothorax noted previously as well as evidence of pleural effusion.

On his first admission to the Montefiore Hospital, January 23, 1946, he appeared well preserved. The neck veins were engorged. Examination of the chest revealed an indurated process in the right lung with the heart, trachea and mediastinum displaced to the right. The heart sounds were distant but regular; blood pressure, 120/70. Electrocardiogram revealed intraventricular conduction disturbance with some over-digitalization effects. The liver and spleen were not felt. The laboratory findings were not remarkable. The patient was treated for heart failure resulting from arteriosclerotic heart disease. He was discharged after a stay of six weeks.

Several weeks later, he noted swelling of the ankles which slowly increased. This was accompanied by shortness of breath. On readmission, August 26, 1946, he was found to have massive edema of the lower extremities. He was dyspneic and orthopneic. Examination of the chest revealed no significant changes from those noted previously excepting for the presence of effusion now in the right pleural cavity. This was aspirated with some relief to the patient. Roentgen examination of the spine revealed the compression deformity noted previously. He was given digitalis, diuretics, salt-poor diet with resulting decrease in edema and improvement in symptoms. He was discharged October 14, 1946, and died at home with symptoms of cardiac failure in April 1949.

Discussion

This study of 443 individual case records, including detailed autopsy protocols of 330, left certain impressions on the writers which cannot be translated into statistical forms. With the full realization that our material represents the end rather than the beginning of the disease, we believe that in the vast majority of individuals with bronchiogenic carcinoma, certainly the anaplastic form, lung resection is not the answer, regardless how soon the condition is diagnosed and treated. In fact, the earlier the operation the more problematic the outcome for the reason that generalization may have already taken the disease beyond the range of local measures. On the other hand, if symptoms have been

present for six months to a year and there are still no signs of metastases, resectional surgery has more to offer. By the same token, the mere fact that the carcinoma may have been present for several years does not per se preclude a surgical attempt at removal providing there are no signs of regional invasion. If the disease is a relatively slow-growing epidermoid carcinoma, especially if it originates in a peripheral bronchus, even better results may be expected. In spite of the dismal prognosis attending rapidly metastasizing bronchiogenic carcinomas every effort should be made to detect and treat the disease early in order to salvage as many individuals as possible in whom the carcinoma may fortunately be of a less virulent type. Early diagnosis will necessitate in many patients exploratory thoracotomy to supplement roentgenography, bronchoscopy and other diagnostic measures.

Any clinical bearing which this study may have on the treatment of bronchiogenic carcinoma will be better appreciated by comparing the natural span of life of such individuals with those submitted to operation. Strictly speaking, the two groups are not comparable. The surgical group had had symptoms for some time prior to operation and their survival time is traced to the time of operation; the length of life of nonsurgically treated patients is traced to the onset of symptoms. However, this discrepancy is partly offset by the fact that patients with inoperable carcinoma are more apt to be in advanced stages of their disease. With due allowance for the many variables, a comparison of the two groups is not beyond the province of this discussion.

In a collected series of 7,815 patients with bronchiogenic carcinoma, reported from 10 medical centers of the United States and England (Table IV), probably representing the best obtainable with surgical treatment of bronchiogenic carcinoma, approximately one-third (2490) were considered operable. In one-half of these (1239), the tumor was found resectable and in the remaining half (1251) nonresectable. Of the resectable group, 72 or 5.8 per cent lived five years or longer. It must be added that of the patients who lived up to five years a good number will very likely be among the five-year survivals in the course of time. The five-year survivals constitute less than one per cent of the original group of patients. In contrast, of the 443 patients who died a natural death (one will do so sooner or later) at the Montefiore Hospital, eight or almost 2 per cent lived five years or longer.

As is well known, statistics if not properly evaluated are apt to be misleading and this applies to the present series of cases no less than to some reported from other clinics. It should not be construed that an individual with bronchiogenic carcinoma has a better chance for survival if he is left alone. On the contrary,

TABLE IV: RESULTS OF SURGICAL TREATMENT OF BRONCHIOGENIC CARCINOMA

AUTHOR (S)	Cases	Thoracotomy Only	Resection	Postoperative Death of Resected Cases	Living More than 5 years	Addenda
Clagett and Brindley (1944)[12]	1101	45	45	14*	—	*7 died within 24 hrs. and 7 in hosp.
Authors' Remarks: "More frequent exploratory operations in cases in which carcinoma of the bronchus is suspected."						
Edwards (1946)[13]	1016	103	70	12	5	
Authors' Remarks: "Probably at the present time not more than 15 per cent of primary carcinomas of the lung are operable when first seen by a doctor."						
Sellors, Cruickshank and Billimoria (1947)[14]	246*	116	130	19	5	*Only surgical cases.
Authors' Remarks: "The results clearly leave much to be desired, but, as in all cases of malignancy, the uncertainty of the result cannot deter the surgeon from undertaking legitimate risks."						
Jones (1947)[15]	196	27	39	2	0*	
Authors' Remarks: "One can safely state that the development of a safe surgical technic for pneumonectomy has far surpassed the clinical advances for the earlier diagnosis of this lesion."						
Brock (1948)[16]	666	50	75	18*	8*	*Based on 101 resections.
Authors' Remarks: There remains much room for improvement . . . greater responsibility rests with those who have the task of making the diagnosis . . . and referring the patient for expert investigation and treatment."						
Lindskog and Bloomer (1948)[4]	200	39	33	6	2 of first hundred cases	Of the second 100, 5 are potential candidates for 5 year survival.
Authors' Remarks: A comparison of two consecutive series of cases, each of 100, gives little reason for optimism . . . percentage of resections has risen . . . reflects increased willingness to carry out so-called palliative resections in hopeless cases."						
Lambert (1948)[7]	349	45	25	7	1	Not all cases followed.
Authors' Remarks: "Resectability is higher in cases with negative bronchoscopic findings: until this fact is appreciated by the medical profession carcinoma of the lung will continue to have the hopeless prognosis that it has had in the past."						

Adams, R. (1948)[6]	182	—	56	8	6	
Authors' Remarks: "The survival rate in patients for whom lobectomy was selected has been as good as for patients treated by pneumonectomy."						
Ochsner, DeBakey Dunlap and Richman (1948)[17]	548	112	195	45	11	
Authors' Remarks: "The most favorable survival rate was found in patients with epidermoid carcinoma and the poorest in these with undifferentiated carcinoma."						
Overholt and Schmidt (1949)[5]	604	127	162	29	10	
Authors' Remarks: "With known and available methods of screening for silent lesions, a significant increase in the salvage rate in primary cancer of the lung should be possible."						
Mason (1949)[18]	1000	151	202	54	5	
Authors' Remarks: "Though our propoganda has certainly brought us more cases it has not led to any improvement in our material We now seem to be involved in what at first sight appears to be wasted effort entailed in investigation of so many hopeless cases."						
Rienhoff (1950)[19]	502*	344	158	41	18	*Only surgical cases.
Authors' Remarks: "Surgical measures short of total pneumonectomy are not efficacious. Postoperative mortality and longevity are at least as good as, if not better than, the postoperative results following the surgical treatment of carcinoma of other organs."						
Ariel, Avery, Kanter, Head and Langston (1950)[3]	1205	92	49	19*	1	*Hospital deaths.
Authors' Remarks: "No cures were obtained with irradiation but prolonged survivals were observed in certain patients."						
TOTAL	7815	1251 16 per cent of Total	1239 16 per cent of Total	274 22 per cent of Resected	72 .92 per cent of Total 5.8 per cent of Resected	Exclusive of potential candidates for 5 year survivals.

pneumonectomy in selected cases offers a much better prospect of longer living. Our findings do suggest that operations on patients with advanced bronchiogenic carcinoma, as applies to most instances at present, are of no avail. In view of the high operative mortality rate (22 per cent in the collected series), reduced in recent years, there is every reason not to subject an individual to operation unless there is reasonable expectation that the patient will stand the ordeal and obtain arrest of the disease. Too many individuals with bronchiogenic carcinoma are being subjected to operation on the supposition that death is a matter of months, and "nothing is lost by the attempt." The fact that 15 per cent of a group of patients with bronchiogenic carcinoma lived two years and longer without surgery is food for thought.

SUMMARY

A group of 443 patients with histologically proved bronchiogenic carcinoma, not treated surgically, was studied with respect to several factors which may have a bearing on duration of life. The following were the pertinent findings:

1) Of the 443 patients, 373 (84.2 per cent) died within two years of the onset of striking symptoms. The remaining 70 (15.8 per cent) lived from two as long as seven-and-a-half years. This group included 18 who lived three to five years and seven who lived five years or longer. The history is cited of one patient (not included in the statistics) who lived more than 17 years from the time the diagnosis of carcinoma was made.

2) Histological study of material of 320 patients examined at autopsy showed that the type of tumor has an important bearing on duration of life. Patients with epidermoid carcinoma lived the longest; those with anaplastic carcinoma, the shortest; those with adenocarcinoma occupied an intermediate position.

3) As a clinical corollary of this study, as well as on the basis of an analysis of the results of surgical treatment reported from 10 large centers of the United States and the Continent, it is concluded that resectional surgery should be restricted to patients in good physical condition in whom the disease is discovered in a relatively early stage. Surgery, we believe, is contraindicated in patients with advanced bronchiogenic carcinoma because of the considerable operative risk and the discouragingly poor results. Certainly, such patients should not be subjected to operation on the principle that nothing is lost by the attempt since death is a matter of a few months in any event. Our study reveals an appreciable number of patients with bronchiogenic carcinoma who lived two years or longer without surgery.

RESUMEN

Se estudió a un grupo de 443 pacientes con carcinoma broncógeno histológicamente comprobado, pero no tratados quirúrgicamente, con respecto a varios factores que queden influenciar la duración de la vida. Los siguientes fueron los hallazgos pertinentes:

1) De los 443 pacientes, 373 (el 84.2 por ciento) murieron en menos de dos años después de la iniciación de síntomas conspicuos. Los 70 restantes (el 15.8 por ciento) vivieron de dos a siete años y medio. Este grupo incluye 18 que vivieron de tres a cinco años y 7 que vivieron cinco años o más. Se cita la historia de un paciente (no incluído en las estadísticas) que vivió más de 17 años, contando desde cuando se hizo el diagnóstico de carcinoma.

2) El estudio histológico de los espécimenes de 320 pacientes autopsiados demostró que el tipo del tumor influye importantemente la duración de la vida. Los pacientes con carcinoma epidermoide vivieron lo más largo, aquellos con carcinoma anaplástico vivieron lo más corto y los que tenían adenocarcinoma ocuparon una posición intermedia.

3) Como corolario clínico de este estudio, y basado también en un análisis de los resultados del tratamiento quirúrgico obtenidos en 10 grandes centros de los Estados Unidos y del Continente, se concluye que debe restringirse la resección a pacientes en buena condición física en los que se descubra la enfermedad en un período relativamente temprano. Opinamos que se contraindica la intervención quirúrgica en pacientes con carcinoma broncógeno avanzado debido al considerable riesgo operatorio y a los pésimos resultados que se obtienen. No deben someterse estos pacientes a la intervención quirúrgica con la idea de que nada puede perderse con el intentado, pues la muerte sobrevendrá de todas maneras en unos pocos meses. Nuestro estudio revela un número apreciable de pacientes con carcinoma broncógeno que vivieron dos años o más sin operación.

RESUME

Un groupe de 443 malades atteints de cancer bronchique démontré histologiquement mais non traité chirurgicalement à été étudié au point de vue de différents facteurs qui peuvent influer sur la durée de leur survie.

1) Sur les 443 malades, 373 (84.2%) moururent dans les deux ans qui suivirent l'apparition de symptômes manifestes. Les 70 autres (15.8%) survécurent de deux à sept ans et demi. Cette catégorie comprend 18 malades qui vécurent de trois à cinq ans et 7 qui vécurent cinq ans ou davantage. L'auteur rapporte l'observation d'un malade non compris dans les statistiques, dont la survie dépassa 17 ans après le moment du diagnostic de cancer.

2) L'examen histologique pratiqué après l'autopsie de 320 malades a montré que la nature de la tumeur a une incidence importante sur la durée de la vie. Ce sont les malades atteints de cancer épidermoïde qui vécurent le plus longtemps, ceux atteints de cancers indifférenciés qui vécurent le mois longtemps, ceux atteints d'adénocarcinomes se placent dans la position intermédiaire.

3) Le corollaire de cette étude, basée sur les résultats chirurgicaux de 10 grands centres des Etats-Unis et de l'Europe, est que l'ablation chirurgicale de la tumeur doit être réservée à des malades en bon état général, et chez lesquels l'affection a été découverte à son début. L'auteur estime que les cancers bronchiques déjà évolués sont une contre-indication à la chirurgie, à cause des risques opératoires considérables et des résultats médiocres et décourageants. Il est hors de doute que de tels malades no doivent pas être opérés selon le principe qu'il n'y à rien à perdre et que la mort chez eux surviendra en tout cas dans quelques mois. L'étude qui à été faite montre qu'il y à un nombre appréciable de malades atteints de cancer bronchique qui vivent deux ans ou plus sans avoir été opérés.

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Discussion

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Chestnut Hill, Massachusetts

The number of these 443 patients with untreated carcinoma of the lung who lived for five years from onset of striking symptoms was seven or 1.6 per cent. The several thoracic surgical reports of the past four years have all shown a striking similarity in numbers of resected cases apparently living and well, five or more years after resection, ranging from 19 to 23 per cent. Although truly stated that the five year survival from all cases in which a diagnosis of pulmonary carcinoma has been made, constitute less than 1 per cent of the original group of patients, whatever the treatment, one must not forget that around 20 per cent of those cases which can be submitted to resection may survive for five or more years. In the present state of our knowledge, or lack of knowledge, concerning carcinoma, one finds herein the only hopeful approach.

The authors reflect our own opinion that resection for oatcell and undifferentiated varieties of pulmonary carcinoma is of dubious benefit, as we have had no patient in either of these categories who lived for as long as one year after resection. We would personally abandon surgery for these two specified types, were it not for the fact that the diagnosis of cell type, as predicted from examination of a bronchoscopic biopsy, must not infrequently be changed when the entire excised specimen has been examined pathologically. Unquestionably in our minds, accurate determination of the microscopic cell type is the most important indicator of prognosis, as reflected by survival times in our groups of cases.

An apparent paradox of carcinoma behavior has again been well illustrated by the writers in citing cases of survival for many months, which came late with disease for treatment, or had no treatment at all. It is pertinent to remark, however, that these same cases might have had the best prospects of any for cure, had they accepted radical therapy at the time of symptom onset.

While emphasizing the urgency for promptness in diagnosis and aggressiveness in surgical removal of resectible lesions, we likewise decry wantom enployment of compassionately named but frequently treacherous palliative operations. Unless one is fairly certain that relief from suffering, logically anticipated, will more than counter balance the attendant expense and discomfort and inconvenience of the operation, then the procedure is but a boomerang of futility to the patient and his surgeon.

ALFRED GOLDMAN, M.D., F.C.C.P.
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The authors have used the five year "cure" as the basis for their discussion. This five year survival rate has many disadvantages as an index for cancer therapy—for example, there is no expression of some difference between treated and untreated disease since as the authors have shown, the surgically treated and the non-surgically treated group had a similar five year survival rate. Survival rates worked out for these untreated cases found by the authors to be 15.8 per cent for two to seven and a half years and 1.5 per cent for five years survival or longer are not always applicable to surgically treatable cases. This proved to be the case in the authors' report, the reason being given that the Montefiore Hospital is a hospital for chronic diseases, whereas the 13 large centers of the United States and the Continent whose collected cases supplied the statistics from which the surgically treated group was collected, 7,815 cases, are from general hospitals for acute cases.

The five year survival rate as an index for therapy of cancer of the lung is not the only value worth measuring. Prolongation of life less than five years, changing the condition of the patient so that life becomes more tolerable by elimination of hemorrhage and infection, elimination of vascular sources of metastases, are features of surgical treatment that are difficult to evaluate, and are almost impossible to accomplish at all without resection of the tumor and its affected lung. Thus it is that given the material such as occurs at Montefiore, the five year survival rate might be nothing with surgery yet the more tolerable life might be prolonged in some of these patients even though all the cancer cannot be removed. I believe that resectional therapy may be indicated many times in patients who are not in such good physical condition and whose disease is not necessarily discovered in a relatively early stage.

Admittedly, the material presented is not satisfactory for comparing the survival rate of treated and non-treated patients with cancer of the lung. No planned experiment has as yet been reported to solve this most important problem of evaluation of surgical therapy for cancer of the lung. There is, however, at the present time an opportunity to set up such a planned experiment. The mass chest survey sponsored by the United States Public Health Service has already and will in the future uncover a large number of small, asymptomatic, early, carcinomas of the lung. Certainly a number of these patients will refuse operation. Certainly those who are operated upon will have a very low mortality rate, which

according to the collected series reported in this paper, was 22 per cent, listed as postoperative deaths of resected cases. This should remove a serious source of error in the five year survival rate since it could be assumed that some of those who died of the operation might have survived five years had they recovered from the operation. Cases similar to those discovered at survey should, like the consecutive series of pneumonectomy for cancer of the lung reported by John C. Jones, have no surgical mortality. It is probable that surgical resection of this type of carcinoma of the lung would yield a much higher and statistically significant five year survival rate. It is significant that according to Wangensteen, the State of Connecticut has a five year cure rate for all cancer of 33.5 per cent. Since essentially cancer of the lung is not different from cancer elsewhere in the body and since we now have the means by mass x-ray survey of the chest to visualize these visceral neoplasms, we can expect that surgical treatment of this type of cancer of the lung, which we hope will be the type of cancer encountered most frequently in the lungs of our future patients shall be accompanied by marked increase in the survival rate.

Beyond any question of a doubt, the authors have demonstrated that cancer of the lung can be of long duration without treatment and that diagnosis until now still remains too late for the achievement of results equal to the 75 per cent cure rates for breast, colon and rectum where lymph node involvement has not occurred at the time of operation. I believe that progress has been made and already large clinics are increasing their five year rate from 15 per cent to 25 per cent; and with the wider use of mass survey of the chest, we have the means through surgery to raise this figure even higher in a short time.

F. M. FELDMAN, M.D.
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I just wanted to make a brief observation. The statisticians have wrestled with this business of recording the mortality or the survival rates of cancer patients for a good many years, but just recently I saw a very good and simple exposition of the principles involved to which I thought some of you might wish to refer.

This article was by Dr. Joseph M. Berkson and appeared in the Proceedings of the Staff Meetings of the Mayo Clinic, Vol. 25, No. 11, May 24, 1950.

CLOSING DISCUSSION

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Dr. Goldman and Dr. Adams have been much kinder to us than we had expected. I simply wanted to point out the fact that carcinoma of the lung, to some extent like pulmonary tuberculosis and other diseases, is not entirely an acutely progressive fatal disease of a few months. There are times and patients when the disease pursues a relatively prolonged and chronic course, also that operation should be done sooner and more intensively in the early disease cases.

Dr. Hilleboe has to some extent answered part of my problem. In the course of routine x-ray inspection of chests, many shadows will be found, lesions that simulate carcinoma. Those patients, the majority, will have to be operated upon, particularly those at the cancer age, if we are to find early forms of cancer. The fact is, in the majority of cases of early carcinoma, the diagnosis should not be made clinically. Once a bronchoscopic examination shows a positive smear, the chances of cure are much less than if the disease is resected without bronchoscopic evidence.

My plea is for early diagnosis and intensive resection of suspected cases, and less surgery for advanced disease or so-called palliative resections. I think the surgeons will agree.

False Positive Bacteriological Reports in Diseases Simulating Pulmonary Tuberculosis*

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Many cases of pulmonary disease whose etiology at first cannot be ascertained pass through the hands of general practitioners and internists. Due to its pleomorphic nature, tuberculosis almost always leads the differential list in the attending physician's mind. While this diagnosis may be difficult to prove, once the patient is considered to be tuberculous, it is even more difficult to disprove. The purpose of this paper is to review the criteria associated with disproving the diagnosis of tuberculosis following one or more positive bacteriological findings.

One must be impressed by the fact that the diagnosis of tuberculosis is accompanied by sociological and economic problems as well as a psychological attitude that is often difficult to combat. Sociologically, the effect on the family group is obvious; financially, the burden of a long hospitalization is extreme, especially so, if the patient is a husband or father; and psychologically, the diagnosis of pulmonary tuberculosis may bring to light many anxieties which otherwise would go unnoticed. Equally important, tuberculosis is a chronic disease whose mortality rate is still discouragingly high. Thus when diagnostic doubt arises, every available means should be employed in evaluating those cases with sputum reported to be positive for tubercle bacilli.

In 1924, the Trudeau Sanatorium staff presented various criteria for the exclusion of tuberculosis in the differential diagnosis of pulmonary disease.[1] Although the study was excellent, medical progress in the past 25 years requires that some of the conclusions be re-evaluated. Even with the present day refinements, however, and with the somewhat improved understanding of the problem of incipient pulmonary tuberculosis, the decision involved in excluding tuberculosis is still difficult. This is especially so when border-line findings are present.

The diagnosis of pulmonary tuberculosis may be obvious if the history, physical and laboratory findings, and x-ray shadows conform to the fundamental patterns with which we are all familiar;

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but, when deviations from these relationships occur, the diagnosis becomes proportionately more difficult. This is especially true when one or more bacteriological examinations recover acid-fast bacilli in the presence of pulmonary disease not previously thought to be tuberculosis. An equally difficult situation arises when one or more acid-fast smears or cultures are recovered through a negative x-ray film and a negative bronchoscopic report are extant. With this in mind, at Fitzsimons General Hospital, we have grouped together those patients admitted during 1948 who at sometime in their hospitalization had one or more positive bacteriological examination reports for acid-fast bacilli, but in whom tuberculosis could not be demonstrated.

Twenty-nine such patients were admitted and later discharged to full military duty. They had been transferred from various station hospitals where acid-fast bacilli were reported by either sputum smear or culture. Before reviewing these cases, one might conclude that the diagnosis was made by over-zealous medical officers. However, this was not the case in the vast majority of these patients. In contrast to many cases of asymptomatic pulmonary tuberculosis, these patients all had symptom complexes closely simulating pulmonary tuberculosis at the time of their original admissions. Cough, ranging from mild and dry to severe and productive was the most common symptom, occurring in 25 of the 29 patients. Eight had experienced hemoptysis, of which three were blood streaking and five frank hemorrhage. Roughly one-third of the cases had temperature elevations, weight loss, and chest pain, usually pleuritic in nature as prominent symptoms. Most of the case histories were so completely like those of typical pulmonary tuberculosis that the physician would look long and hard for further evidence, both roentgenological and bacteriological. Physical examinations including x-ray films, of course varied with the parenchymal pathology present. Seventeen had negative serial x-ray films of their chests; and six had infiltrations or pneumonias which were transient. Persistent infiltrations were present in six.

An average of 12 to 13 months had elapsed since the one or more positive bacteriological examinations were reported. Letters of inquiry were sent to the 14 patients who were diagnosed as having upper respiratory infection, chronic bronchitis, or no pulmonary disease; and they also were sent to three others in whom the diagnosis of tuberculosis was still in doubt. A similar letter was sent to each of their medical officers requesting a recent x-ray film, sputum examinations, and their clinical impression of each patient. From the 17 letters, we received 14 answers. One patient may have pulmonary tuberculosis while the others do not. We

were impressed by the persistent marked respiratory symptoms, as cough, sputum production, chest pain, etc., which were still present in over half of the patients who answered our inquiry. However, roentgenological and bacteriological evidence of pulmonary tuberculosis was lacking.

While all of these patients entered Fitzsimons General Hospital with a primary diagnosis of pulmonary tuberculosis, our final diagnostic findings were the following: Twelve were negative or had merely upper respiratory infections; four had bronchiectasis; four acute pneumonias, viral or bacterial; two chronic bronchitis; two bullous type of emphysema; one chronic progressive pulmonary fibrosis of unknown etiology; one influenza; one mediastinal effusion; one hemangioma of the lung; and one pulmonary calcifications, probably due to benigh histoplasmosis.

The bacteriological examination of sputum and gastric contents for pulmonary tuberculosis is the most important of any specific laboratory finding. However, the factors related to the laboratory procedure itself may be in question.

There are three principle sources of false positive bacteriological examinations for the tubercle bacillus. The first of these, and perhaps of great importance, are the acid-fast saprophytes. These acid-fast rods, such as the butter bacillus, the timothy grass bacillus, smegma bacillus, etc., are wide-spread in nature and are easily recoverable in soil, on fresh vegetables, tap water, the human mouth, excreta, etc.[2] In culture they are usually smooth, glistening chromogenic colonies varying from light yellow to deep orange. Guinea pig inoculation does not produce the progressive generalized fatal tuberculosis of the pathogenic mycobacterium.[3] False positives were also present in guinea pig inoculations and culture media, usually due to cross-contamination and the faulty technique of the bacteriology technician. Unless the interpreter is well trained and the best laboratory procedures are strictly followed, cross-contamination is apt to occur. The third source of false positives is that of human frailty—interpreting into a slide what previously had been concluded to be present. There is no way to measure the frequency of misinterpretation, but without doubt it must be common.

Our false positives included misinterpretation of one or more of all five commonly used bacteriological procedures. The greatest number (18) were by sputum smear examinations. In addition, there were five sputum cultures and gastric cultures, three gastric smears, and three guinea pigs. Ten of the 29 patients had two or more positive reports. The plain or concentrated gastric smear is the least likely to give definite evidence of tuberculosis and should not be used. It is hardly worthwhile, as only 4.8 per cent of known

tuberculosis patients who are positive by other methods will be positive by concentrated gastric smear.[4]

We can easily appreciate the difficulty encountered in excluding pulmonary tuberculosis from the differential diagnosis when our patient has symptoms, signs, and positive laboratory evidence. To better illustrate this problem, four case histories will be presented. The first had negative serial x-ray films of his chest; the second, chronic, persistent pulmonary infiltration; the third, acute pneumonia, which resolved rapidly; and the fourth, chronic pulmonary infiltration with a persistently negative tuberculin skin test.

Case I: Negative Roentgenogram.

This patient is a 21-year old Negro male who was entirely well until July 1948, when he first noticed a moderate cough productive of one to two tablespoonsful of sputum daily, anterior chest pain, and a progressively increasing fatigue. An x-ray film was obtained and a questionable area of infiltration was noted in the first anterior interspace on the left. He was hospitalized on August 5, 1948, during which time two positive smears for acid-fast bacilli were recovered; he was immediately transferred to Fitzsimons General Hospital.

Upon admission he was asymptomatic and afebrile except for a mild cough, and physical examination was negative throughout. X-ray film on admission, and a review of the previously available films demonstrated some slightly increased bronchovascular markings, but no areas of infiltration. His blood studies, bronchoscopy and serial x-ray films thereafter were negative. Three sputum smears and nine gastric cultures were negative for acid-fast bacilli. He was placed on graduated increasing activity and returned to full military duty.

Diagnosis: No disease found. Tuberculosis suspected.

Case II: Chronic Pulmonary Infiltration.

This patient is a 19-year old white male who was entirely well until July 1948, when he had a sudden onset of severe right anterior chest pain, a moderate cough, productive of one tablespoonful of brown sputum, malaise, and temperature elevation of 101 to 102 degrees F. He was admitted to the Station Hospital and a diagnosis of right lower lobe pneumonia was made. This was treated with penicillin and symptoms subsided, except for pleuritic type pain. X-ray inspection of the chest revealed an infiltration in the left mid-lung field. He was transferred to a general hospital in Germany where two sputum smears were found positive for acid-fast bacilli. A diagnosis of tuberculosis was made, and he was transferred to Fitzsimons General Hospital.

On admission here, he was completely asymptomatic; his physical examination was essentially negative. The x-ray film of his chest revealed what appeared to be an area of infiltration in his left-lung field and the parenchyma, both superior and inferior to the infiltration, was emphysematous in character. Blood studies, urine, and serology were negative. First strength Mantoux was positive. Repeated smears and cultures for acid-fast bacilli were negative after the previously reported positives. At Fitzsimons General Hospital, there were three negative sputum smears and six negative gastric cultures. Bronchoscopy was performed and no

endobronchial disease noted. Bronchograms were ordered and lipiodol appeared to be concentrated in the area of supposed infiltration. An area in the lingula of the left upper lobe which remained surrounded with lipiodol was interpreted as an emphysematous bleb. The patient's induction x-ray film was recovered, and it too revealed the emphysematous areas superiorly and inferiorly and the concentrated bronchovascular markings in the left-lung field.

Diagnosis: Pulmonary emphysema, bullous type, etiology unknown.

Case III: Acute Pneumonia, Atypical.

A 43-year old white male who was entirely well until December 17, 1947, when he noted fever, cough, chest pain, and copious brown sputum. On December 29, 1947, he was admitted to a United States Army Station Hospital where he received streptomycin, 0.5 grams twice a day for 10 days, and penicillin, 50,000 units every three hours. At this time there was almost complete consolidation of the right lung and a slight amount of fluid at the base of the right lateral chest wall. This was tapped with removal of 10 cc. of sterile amber fluid. His hospital course was acute with temperatures up to 102 to 104 degrees F., and white blood count increased from 2,000 on the day of admission to 2,500 six days later. Sputum cultures at this time showed no predominating organisms and therapeutically the patient did not respond specifically to antibiotic therapy. Blood culture was negative. X-ray inspections demonstrated rapid clearing of the lesion between December 25, 1947 and January 12, 1948.

The patient was transferred to an Army general hospital where x-ray inspection revealed a residual infiltration in the right upper lobe. While on convalescent leave, however, a positive sputum culture for acid-fast bacilli was reported (May 22, 1948). The patient was transferred to Fitzsimons General Hospital.

On admission here, he was asymptomatic; physical examination, serology, and urinalysis, were negative. First strength tuberculin (Mantoux) was negative, second strength, four plus; complete blood count was within normal limits, but sedimentation rate was 15/60 Wintrobe. This fell to 1/60 within two months, and three negative sputum smears, three negative sputum cultures, and six negative gastric cultures were obtained. Bronchoscopy revealed no abnormality. X-ray films revealed slight right upper lobe fibrosis on admission to Fitzsimons General Hospital, and no appreciable change was noted in the subsequent months.

He was observed at Fitzsimons General Hospital for approximately four months and then given a 45 day convalescent leave. X-ray films at the end of this period showed no change, and the patient was returned to duty. After careful study and follow-up over 10 months, no definite diagnosis of tuberculosis could be made.

Diagnosis: (1) Pneumonia, atypical, right lung. (2) Pleuritis, serous, acute, secondary to diagnosis 1. (3) Pulmonary fibrosis, right upper lobe, due possibly to diagnosis 1.

Case IV: Negative Tuberculin Skin Test with Pulmonary Infiltration.

This patient is a 19-year old white male who had a routine x-ray film for separation from the service in the late spring of 1948. This revealed multiple discrete areas of calcification throughout both lung fields, but

especially so in the left upper lobe, and in June 1948, he was hospitalized for observation. On admission he stated that during the past two months he had noted anorexia and a 16 pound weight loss. On June 24, 1948, while in the hospital, he experienced an attack of hemoptysis, approximately one teaspoonful. A positive sputum smear was reported on the following day, and he was immediately transferred to Fitzsimons General Hospital.

On admission here, he was asymptomatic and afebrile, and physical examination was negative except for an exostosis of his left femur. X-ray inspection of his chest revealed the multiple areas of calcification throughout the lung fields, especially concentrated in the left hilus and left upper lobe. His blood studies, urine, and serology were negative. The tuberculin test (Mantoux) was negative on six occasions, using both first and second strength solutions. His coccidioidin test was negative, but his histoplasmin skin test was three plus. Six sputum smears, three sputum cultures, and six gastric cultures were negative for acid-fast bacilli, as were fungus studies. Bronchoscopy was normal. He was presented to the disposition board and it was felt that he could be returned to full military duty or discharged from the Army. The calcification was due, possibly, to benign histoplasmosis or previously healed tuberculosis.

Diagnosis: Pulmonary calcification.

Since this problem is unavoidable, every physician is often confronted with similar confusing circumstances and ultimately a decision intended to best protect the health of his patient. However, there are several evaluations and procedures which may influence his opinion and, in turn, save valuable time and apprehension when active pulmonary tuberculosis is to be eliminated from the differential diagnosis.

When the acid-fast organism report is first obtained, there should be a thorough review of the case history, physical examination, other laboratory findings, and x-ray films. If good direct or deductive evidence of pulmonary tuberculosis is lacking, further diagnostic procedures are indicated. When pulmonary infiltration is present, serial x-ray films should be evaluated from the point of view of change. Do the history and physical findings parallel those of the x-ray films? Pulmonary tuberculosis rarely resolves rapidly from week to week.

Laboratory procedures for tuberculosis are simple and offer an excellent opportunity for rechecking previously reported positives. Repeated sputum smears and cultures, gastric cultures, and guinea pig inoculations should be performed. A total of 10 examinations should be sufficient, such as four sputum smears, three sputum cultures, and three gastric cultures. Guinea pig inoculation is highly desirable if it is available. In event no sputum is produced, gastric cultures should be obtained. Our patients had an average of 12 negative examinations, as above, subsequent to the original positive. Pinner states that 71.6 per cent of 618 active tuberculosis patients were positive in their first three examinations. In all,

86.1 per cent of these patients had positive bacteriological evidence of tuberculosis, and 13.7 per cent were negative throughout.[5] On the other hand, investigation has proved that healthy adults never have positive gastric cultures even though they may be in constant contact with positive tuberculosis patients.[6]

Skin testing for tuberculosis is becoming more and more important as a differential examination in the exclusion of tuberculosis. It has long been recognized that a negative tuberculin test almost always excludes the possibility of tuberculosis. Although the percentage differs in various localities of the United States, more than 60 to 70 per cent of the young people do not react to tuberculin, and the percentage is steadily increasing. Of our patients, eight had repeatedly negative tuberculin skin tests by intradermal injection. Negative tuberculin tests are occasionally seen in active tuberculosis, but not often enough to be of practical importance. In one series of 11,747 tuberculous patients tested, only four had persistently negative tuberculin tests.[8] Rarely, terminal stages of far advanced tuberculosis, tuberculomata, and tuberculous adenitis may be accompanied by negative tuberculin skin tests. Early primary tuberculosis may show negative, but the tuberculin test will change quickly to positive.

Bronchoscopy has become an invaluable aid in determining the presence of tuberculous endobronchial disease in the larger bronchi and trachea. Of our 29 patients, 20 were bronchoscoped with 18 normal tracheobronchial trees found. One patient with proved pulmonary hemangioma had diffuse hyperemia of the entire mucosa; and one with bronchiectasis showed acute generalized bronchitis. Bronchograms consistently differentiate bronchiectasis from tuberculosis in cases of repeated hemoptysis. Four cases of our small series had bronchiectasis rather than tuberculosis.

During the past few years, x-ray films have been made routinely in civilian mass surveys, military inductions, hospital admission, and in insurance and industrial examinations. These should be obtained wherever possible as they are invaluable in estimating the activity or the age of a pulmonary infiltration. For this reason chest x-ray films should never be destroyed.

Finally, it may be necessary to use a trial of graduated activity in the exclusion of tuberculosis. Frequent observations are a necessary caution in determining the degree of activity allowed to the patient. Consultations with physicians in active association with tuberculosis are valuable. As medical knowledge progresses, the distinction between all diseases, including tuberculosis, becomes finer and finer; and it behooves us to use every available means in the solution of such problems as have been presented.

Discussion

1) This study concerns 29 patients admitted to Fitzsimons General Hospital during 1948. In none of them could active pulmonary tuberculosis be demonstrated, although all had bacteriological evidence of tuberculosis on one or more occasions sometime during their hospitalizations. Among the false positives there were 18 sputum smears, five sputum and gastric cultures, three gastric smears, and three guinea pig inoculations. Ten of the 29 patients had more than one false positive bacteriological examination.

2) These patients have resumed full military duty or civilian occupation. An average of 12 months has elapsed since the positive bacteriological examination was reported. Follow-up letters have been written to each patient and his respective medical officer. Of the 17 patients who were discharged with diagnoses of upper respiratory infection, chronic bronchitis, or no pulmonary disease found, or in whom some doubt of tuberculosis was still present, 14 have returned the letters or visited us personally. One of these has evidence of pulmonary tuberculosis. Many still have marked respiratory symptoms, but roentgenological and bacteriological evidence of pulmonary tuberculosis is still lacking.

3) Acid-fast saprophytes, cross contamination, and misinterpretation are the three principle sources of false positive examinations.

4) All patients had symptoms referable to some pathology of their respiratory systems. Bronchiectasis, acute pneumonitis, chronic bronchitis, chronic pulmonary calcification, bullous emphysema, mediastinal effusion, chronic, progressive pulmonary fibrosis, and upper respiratory infection were diagnosed in lieu of tuberculosis.

5) Although a positive sputum has been obtained, the diagnosis of pulmonary tuberculosis may still be in abeyance. When question arises, a review of the history, physical findings, x-ray films, skin tests, sputum, bronchoscopy, and bronchograms are indicated.

6) In the event the diagnosis is still undecided, bed rest with graduated activity under close observation of the physician is indicated.

SUMMARY

The bacteriological examination of sputum and gastric contents for tubercle bacilli is by far the most important of any specific laboratory finding in cases of questionable pulmonary disease. However, the factors related to the laboratory examination itself may be in question. A positive sputum smear, sputum or gastric culture, or guinea pig inoculation in the presence of either a negative roentgenogram or pulmonary infiltration still requires

analysis of the history, the physical examination, and the roentgenogram in addition to the positive bacteriology.

RESUMEN

El examen bacteriológico de los esputos y contenido gástrico en busca de bacilo de Koch, es el más importante de todos los hallazgos de laboratorio en casos dudosos de enfermedad pulmonar. Sin embargo, los factores relacionados con el laboratorio mismo pueden estar en duda. Un frotis, un cultive de esputo o lavado gástrico o una inoculación al cuy en presencia de radiografía negativa o sin infiltración pulmonar, aún requiere un análisis de la historia clínica de la exploración física además del hallazgo bacteriológico positivo.

RESUME

La recherche bactériologique des bacilles de Koch dans les crachats et le contenu gastrique est de loin la recherche de laboratoire spécifique la plus importante dans l'étude des affections pulmonaires. Cependant les conditions de l'examen de laboratoire doivent être mises en question. Un examen positif de crachats, de culture de crachats, ou du contenu gastrique positifs, una inoculation positive au cobaye, demandent une étude très fouillée du malade si sa radiographie ne présente aucune anomalie ou si elle nemontre qu'une infiltration pulmonaire discrète.

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Cor Pulmonale

A Report of an Additional 52 Cases Compared with a Previous Study of 50 Cases*

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In 1941, Scott and Garvin[1] reported on a series of 50 autopsied cases of cor pulmonale. There have since been sporadic case reports and discussion on diagnosis and treatment of this condition. A survey reveals some 54 articles dealing with this subject of which only the one by Spain and Handler[2] and the other by Spatt and Grayzel[3] review a significant number of cases.

We decided to review the cases at Cleveland City Hospital for the period 1941-1947 and to compare these observations with those initially reported from the same hospital by Scott and Garvin. A total of 52 cases were found which would meet the qualifications for the anatomical diagnosis as laid down previously. That is that the right ventricle measure at least 5 mm. in thickness and that all cases of valvular heart disease, those with a significant degree of coronary artery sclerosis, those with a finding of hypertension or a history of such, and those who showed any significant degree of nephrosclerosis be excluded.

These 52 cases occurred in a series of 4,021 consecutive autopsies which were performed at Cleveland City Hospital during the previously mentioned six-year period. Of this total number 743 died of heart disease of which 52 were cor pulmonale, making an incidence of 7.1 per cent which compares with the original reported incidence of 6.3 per cent.

Here as before in a few cases the right ventricular hypertrophy became extreme (Table I). However most of the patients succumbed before it attained a thickness of more than 8 mm.

The left ventricle as first reported showed varying grades of hypertrophy. In 93 per cent the left ventricle measured 12 mm. or more and in 41 cases or 78 per cent it measured 15 mm. or more. The cause of this hypertrophy is not clear. However the recent work of McMichael and Sharpey-Shaffer[4] may tend to elucidate this problem since they showed that patients with cor pulmonale had increased cardiac outputs which tended to remain elevated even when cardiac failure occurred.

Again the incidence of advanced lung disease, particularly em-

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physema alone or in combination with other disease, correlates well with the previous study (Table II).

TABLE I: RIGHT VENTRICLE MEASURES

	Present Series	Scott and Garvin
5 mm.	9	8
6 mm.	9	12
7 mm.	14	10
8 mm.	11	11
9 mm.	4	2
10 mm.	3	3
11 mm.	1	1
12 mm.	1	2
14 mm.	1	1

TABLE II: HEART WEIGHTS

	Present Series	Scott and Garvin
150-200 Gm.	1	
200-250 Gm.	2	
250-300 Gm.	2	1
300-350 Gm.	3	2
350-400 Gm.	8	9
450-500 Gm.	7	6
500-550 Gm.	8	14
550-600 Gm.	10	2
600-650 Gm.	2	2
650-750 Gm.	1	1

Clinical Observations

The clinical observations, as in the first paper, were not complete as 21 of the cases were in the hospital less than six days.

In this series it was found that 45 or 86 per cent died in their first attack which is quite comparable to the 86 per cent reported in the first paper.

Age: The majority in this series were over 50 years of age. One case however was found in a child of 10 years who had generalized pulmonary fibrosis. All the cases in the original paper were adults.

Sex: All but three of the cases were in males. In the original paper only two were female.

Race: In this series there were six Negroes.

Place of birth: In the previous paper 68 per cent were foreign

born and the majority of these were from southeastern Europe. This would tend to bear out the original statement[1] that "we have felt for some time that there was a higher incidence of chronic pulmonary emphysema in the peasant classes of southeastern Europe than in similar classes from other parts of the world." In this connection it is interesting that Cleveland has relative to total population a larger number of immigrants from southeastern Europe than eight other large American cities. This fact probably has some bearing on the high incidence of cor pulmonale at the Cleveland City Hospital.

Signs and symptoms: In this series as in the first it was rather difficult to distinguish cardiac symptoms from those caused by associated pulmonary disease. As previously stated, cough, dyspnea on exertion and cyanosis were the usual complaints and had often continued for several years, whereas the signs of right ventricular failure, i.e. venous distention, hepatic enlargement, edema and ascites rarely lasted longer than six to eight months. This bears emphasis once again that until the appearance of such signs there is no clear-cut evidence to incriminate the heart.

All the cases were reported as very cyanotic and varying degrees of dyspnea were present. We also observed, as previously, that respiratory distress was an outstanding feature and unlike that observed in the usual case of left ventricular failure, periodic breathing of the Cheyne-Stokes type and attacks of nocturnal dyspnea were rarely seen.

Laboratory data: An erythrocyte count was done in this series in 32 cases and in 11 it was above 5,000,000. Two counts were 7,000,000. Hemoblobins were recorded as high as 24 gms. and the majority were over 15 gms.

An electrocardiogram was taken in 24 cases and of this number 13 showed right axis deviation, a somewhat lower incidence than the original series showed.

In our second series as well as the first many patients were so ill at the time of admission and failed so rapidly that satisfactory roentgenologic studies were not possible. In six out of 39 in which x-ray studies were made the roentgenologist reported enlargement of either the conus pulmonalis or the body of the right ventricle. This is quite low as the original report showed 10 out of 19 that had x-ray examinations.

The majority of blood pressures were in the range of 120 systolic over 80 diastolic. No pressures were recorded over 150 systolic.

It is of interest to also point out that usually one bout of failure was all that the patient could withstand. Eighty-nine per cent of our patients died with their first attack of congestive failure. Nine per cent had two attacks and three per cent had three

distinct bouts of failure. Again this is quite comparable to the first report.

The vital capacity in our series, except in one case, was under 50 per cent, ranging as low as 20 per cent in five cases.

Clinically the diagnosis of cor pulmonale was made correctly in 23 cases or 42 per cent of the total. The most common incorrect diagnosis was that of coronary artery sclerosis.

In only nine cases was the pulmonic second sound louder than the aortic second sound. One can readily appreciate this low incidence because at times auscultation may be difficult in emphysematous chests. When present, this can be a helpful sign in demonstrating increased pressure in the pulmonary artery. The physical findings in the heart are usually quite scarce and demand careful appraisal. Only six or 11 per cent had a diastolic gallop rhythm. Three had auricular fibrillation. Two cases had a paradoxical pulse. Only seven had a systolic murmur at the mitral area. Two cases deserve special mention for the reason that they had diastolic murmurs at the pulmonic area which were easily heard and were constantly present. These signs represented insufficiency of the pulmonic valve which was proved at autopsy.

SUMMARY

An additional 52 cases of cor pulmonale are analyzed and compared with the data recorded previously in a series of 50 cases from this hospital. A positive correlation was carried out on all points mentioned previously and no significant findings are compiled to refute what was set down in the early paper.

RESUMEN

Se analizan 52 casos adicionales de corazón pulmonar con los datos antes relatados de 50 casos, en este hospital. Hay una correlación franca entre los datos obtenidos previamente y no hay nada que refiere los hallazgos de la primera serie.

RESUME

Les auteurs analysent 52 nouvelles observations d'insufsisance cardiaque d'origine pulmonaire et les somparent avec les 50 cas précédemment étudiés dans le même hôpital. Ils maintiennent tout ce qu'ils avaient constaté alors et n'ont rien observé qui soit en contradiction avec leurs premières affirmations.

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Diagnosis and Treatment of Carcinoma of the Esophagus*

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Carcinoma of the esophagus is no longer considered an inoperable lesion. Operative procedures which aim at both a permanent cure or a prolongation of life have been standardized. Many surgeons including F. Torek,[1] Sauerbruch,[2] Fischer,[3] Ochsner and DeBakey,[4] Adams and Phemister,[5] Garlock,[6] Carter, Stevenson and Abbott,[7] Jonas,[8] Marshall,[9] Cattell,[10] and Churchill and Sweet,[11] have successfully resected malignant lesions involving both the esophagus and the cardiac end of the stomach.

In 1895, Rehn[12] was the first to mobilize the human esophagus extrapleurally. Faure[13] in 1903, extirpated a carcinoma of the esophagus extrapleurally in two patients; both of these died. In 1907, Wendel[14] resected the lower end of the esophagus and reestablished the continuity of the alimentary tract by devising a lateral anastomosis with a Murphy button. Torek[1] performed the first successful resection of the thoracic esophagus for carcinoma in 1913; his patient survived for 11 years without evidence of recurrence. In this operation Torek brought the upper end of the esophagus out onto the neck and restored continuity by means of a rubber tube which connected with a gastrostomy. Numerous other attempts have been made, but these procedures have given poor results and a high mortality for the following reasons:

1) Inaccessability of the esophagus.
2) Lack of a serous coat surrounding the esophagus.
3) Fear of entering the pleural cavity.
4) Working in an area where infection spreads rapidly and is especially dangerous.

It is only during recent years that surgeons have renewed their attack upon this problem, and this has resulted in a greater percentage of success and promise for the future. This report covers an experience with 71 cases from which impressions have been gathered regarding the surgical management of esophageal carcinomas.

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Of the 71 cases seen during the period extending from January 1946 to October 1950, there were 31 or 44 per cent which were found to have tumors that could not be removed. In the remaining 40 or 56 per cent a radical resection followed by intrathoracic esophagogastric or esophagojejunal anastomoses was performed. In 31 cases it was impossible to extirpate the lesion due to extensive local fixation and invasion of important structures, such as the aorta, pulmonary vein or bronchus. In the 40 patients who had an esophagectomy performed, nine died due to cardiopulmonary complications, and the 31 who are alive are improving clinically at the present writing. In the group which had resections performed, 27 had lesions in the lower esophagus and cardiac end of the stomach (Zone 3), and in 13 the malignancy was found in the midthoracic region (Zone 2). It is interesting to note that of the 71 cases operated upon, 49 patients were over 65 and the remaining 21 were between 45 and 50 years of age.

Churchill and Sweet[11] have divided the esophagus into fourths rather than the classical division into thirds. Their second and third fourths constitute the middle section of the esophagus. By means of this division it is possible to consider the esophagus as having three zones. Zone 1 extends from the base of the neck to the superior aspect of the aortic arch. Zone 2 includes the middle portion which extends from just above the aortic arch to a point just below the level of the inferior pulmonary vein. Zone 3 is the lower fourth of the thoracic esophagus, the cardiac orifice of the stomach and just a few centimeters of stomach including the fundus. Making use of these zones, we have tried to standardize a given procedure or procedures for each zone.

Zone 1 affords the greatest technical difficulties; fortunately this is an uncommon location for carcinoma. Lesions of this part of the esophagus present a specialized problem and the operative procedures are still being perfected. Sweet[15] has standardized the surgical treatment for carcinoma of the midthoracic esophagus (Zone 2); he does a resection with high intrathoracic esophagogastric anastomosis. For lesions involving Zone 3 as well as the cardiac portion of the stomach, a combined thoraco-abdominal approach as described by Garlock[16] is most applicable.

Treatment of Zone 1 Lesions

Technical difficulties for lesions in this zone are rapidly being overcome by means of esophagogastrostomies performed in the cervical rib (Figure 1). This procedure necessitates two incisions, one placed in the cervical region and another placed in the chest. The thoracic phase of this operation involves the removal of one or two ribs plus the sectioning of one or two additional ribs. The

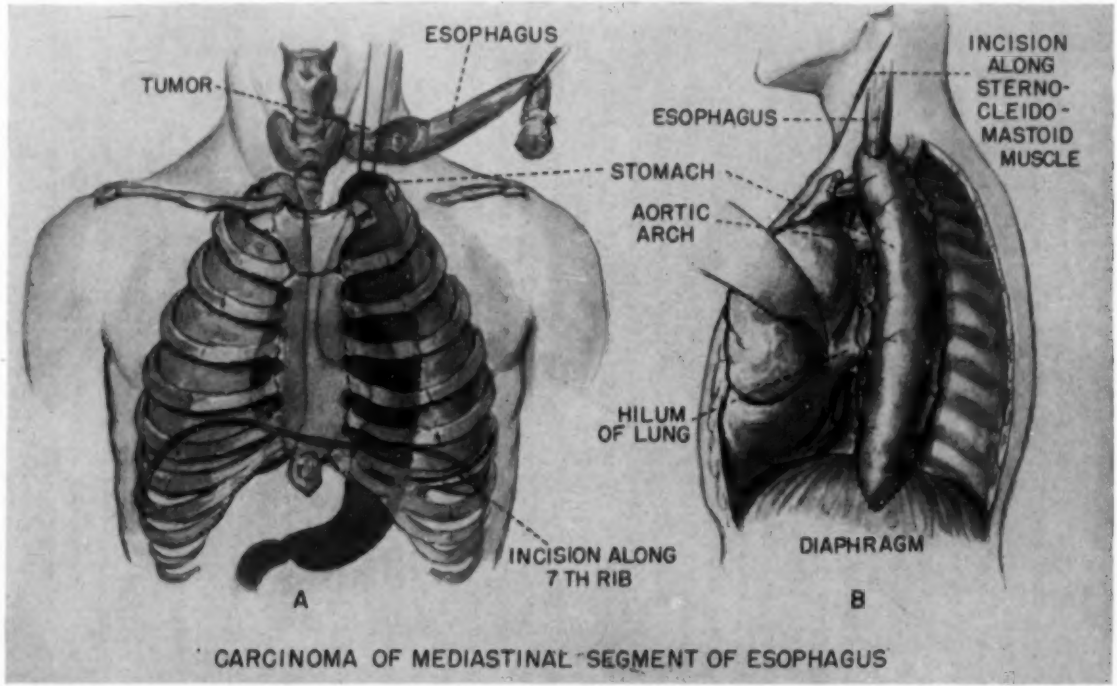

FIGURE 1: (A) The stomach and esophagus have been mobilized and the former is placed in the neck. In this instance it was necessary to remove parts of the clavicle and the first rib to increase the size of the thoracic inlet.—(B) A side view of the completed operation.

esophagus is mobilized behind the left subclavian artery by severing the pleura directly over it. The mobilization of the supra-aortic esophagus extends from the arch of the aorta upward to and even above the thoracic inlet. It is during this early phase of the operation that operability in lesions involving the superior mediastinal esophagus and the cervical esophagus can be determined.

If the lesion is considered operable, and this is determined by fixation to surrounding structures rather than the absence or presence of metastases, then the infra-aortic mobilization is started. This phase of the procedure incorporates mobilization of the esophagus from its mediastinal bed from the arch of the aorta to its junction with the stomach. The diaphragm is divided and the stomach is mobilized to within an inch or two of the pylorus; the gastric blood supply is maintained by intact right gastric and right gastro-epiploic arteries. The esophagus is divided at the esophagogastric junction and it is placed over the aortic arch. The remaining opening in the stomach is closed, since its location does not permit its usage in the anastomoses. The stomach is passed up toward the thoracic inlet and behind the pulmonary hilum and the chest is closed. The cervical part of the operation is performed through a long incision placed along the left sternocleidomastoid muscle. The mobilized esophagus is brought out the cervical wound and the stomach is delivered into the neck. Esophagectomy is performed and end to side esophagogastrostomy completes the procedure.

Treatment of Zone 2 Lesions

It is in lesions which involve this zone, that Sweet's[15] procedure is best utilized. This is a partial esophagectomy and partial gastrectomy followed by a supra-aortic intrathoracic esophagogastrostomy.

Case Report:

The following is a typical example of a patient with a Zone 2 lesion:

The patient, J. B., a 66 year old white male, entered the hospital on April 14, 1947, stating that he had pain beneath the middle of the sternum following each meal; this complaint started in August 1946. In February of 1947, he complained of difficulty in swallowing solid foods. Regurgitation and vomiting were present and in the last three months he lost 18 pounds. At present he was only able to swallow liquids. Temperature, pulse and respirations were normal and blood pressure was 144/80. Physical examination was essentially normal. X-ray examination revealed a filling defect and definite narrowing about the midthoracic esophagus. He was esophagoscoped and the biopsy revealed a squamous

cell carcinoma. On April 23, 1947, he was operated upon and a partial esophagectomy with a supra-aortic esophagogastric anastomosis was performed. The pathologist reported a hornifying squamous cell carcinoma of the midthoracic portion of the esophagus. With the exception of a rise in temperature of 102 degrees F. on the second postoperative day, this patient's postoperative course was quite uneventful. Postoperative chest x-ray films revealed some exudative fibrous pleuritis of the left hemithorax. Some slight dyspnea was present, but the breath sounds were heard. He was out of bed on the fourth postoperative day. To date, he is still improving and is on a liberal diet.

Treatment:

It must be emphasized that no surgeon can be expected to do this type of surgery without the aid of a competent anesthetist. By competent anesthetist we mean one who not only can give a perfect intratracheal positive pressure anesthesia, but who also is versed in the minutia of pre- and postoperative care. Ample blood and plasma are provided.

The patient is placed on his right side with the left arm held forward and the left side of the chest arched upward. The incision begins at the left costal margin anteriorly, extends backward usually over the seventh or eighth rib, and ends by extending upward between the spinal column and the left scapula (Figure 2). A wide resection of the rib is accomplished by cutting its cartilage anteriorly and its neck posteriorly. To obtain proper exposure, it is usually necessary to divide the seventh, sixth and fifth ribs posteriorly and at times the ninth rib. These ribs are either severed or small sections are removed; however, we have found that removal of a small segment produces less postoperative pain. The left thoracic cavity is entered, a rib spreader inserted and the field completely exposed. The inferior pulmonary ligament and mediastinal pleura are incised, and resectability of the growth determined. Extensive involvement of the left main bronchus, aortic arch or inferior pulmonary vein usually signify an inoperable condition. Dissection is begun anterior to the esophagus, and if these three structures can be safely avoided, the posterior dissection is started. After freeing the esophagus anteriorly and posteriorly the growth is freed from the right mediastinal pleura. At times it may become necessary to remove a portion of this layer, which results in an opening into the right thoracic cavity. The surgeon relies upon the skill of the anesthetist and the closed system by means of which he can exert positive pressure and prevent or re-expand a collapsed right lung. Sweet[15] states that in 32 cases the right pleural cavity was entered 13 times. No attempt is made to close such a defect, because after the left lung has been expanded and the chest closed no ill effects have resulted.

At this point in the dissection the esophagus has been mobilized from the aortic arch downward to the diaphragm. The abdomen is then entered through an incision in the diaphragm which extends radially from the esophageal hiatus to the costal margin. The branches of the phrenic artery which supply the diaphragm are usually quite large and bleed profusely, hence they are individually severed and ligated. The upper two-thirds or three-fourths of the stomach is mobilized by dividing the gastrosplenic ligament and severing and ligating the vasa brevia and left gastro-epiploic vessels. The gastrocolic ligament is divided as far as the pylorus; the right gastro-epiploic vessels are spared. The lesser curvature of the stomach and the lower end of the esophagus

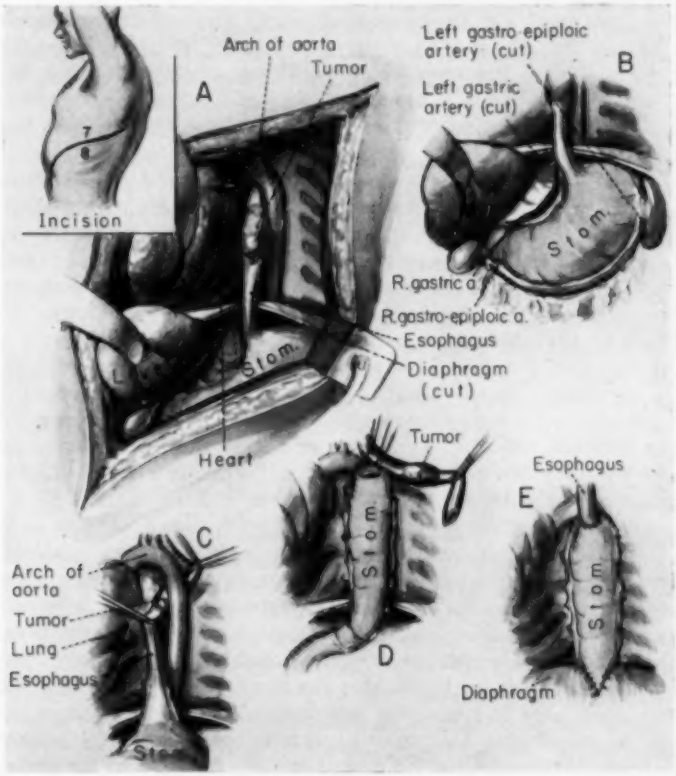

FIGURE 2: Surgical Treatment for Zone 2 Carcinoma.— (A) Infra-aortic esophageal mobilization.— (B) Gastric mobilization.— (C) The esophagus is mobilized above the arch of the aorta.—(D) The esophagus is displaced over the aortic arch.—(E) The completed operation.

are mobilized by division of suprarenal, phrenic and pericardiophrenic vessels. The left gastric artery can now be easily identified, cut and tied close to its origin near the celiac axis. This extensive mobilization permits the fundus of the stomach to be placed into the apex of the chest with ease.

The stomach is divided distal to the cardia; the distal portion is inverted by means of a two layer closure, the first layer is usually a continuous catgut suture and the second interrupted cotton. Heavy crochet cotton placed around a piece of gauze closes the lower end of the esophagus.

The dissection is next carried above the aortic arch. An incision is made in the mediastinal pleura above the arch, and that part of the esophagus which lies in the superior mediastinum is freed. The attachments of the esophagus behind the arch are completely freed by dividing small arteries which arise from the aorta and some additional branches which arise from the bronchial arteries. When the esophagus is properly mobilized, it becomes possible to pull it up from behind the aortic arch, turn it outward and perform an esophagogastric anastomosis.

An outer layer of interrupted cotton sutures is placed which approximates the muscular coat of the esophagus to the serosa of the stomach. Because of the lack of serosa on the esophagus and its longitudinally placed musculature, it is best to use a mattress type of stitch. An opening is made high on the fundus of the stomach, and the posterior esophageal wall is incised. The edges of the stomach and esophagus are sutured by means of through and through interrupted cotton sutures. The tumor and major portion of the esophagus are removed. A Levine tube is passed from the nose through the esophagus, over the suture line and into the stomach. Two anterior suture lines are now placed over the tube: an anterior through and through and an anterior musculoserous. Some surgeons object to placing a tube over a suture line especially where the blood supply is poor. I have never hesitated to employ such a tube in my esophageal work, and have used it as well in anastomoses which involve the distal sigmoid and rectum even after severing the superior and middle hemorrhoidal vessels. I believe that if the caliber of the tube over which the anastomosis is made is smaller than the stoma through which it passes, pressure is avoided and the blood supply is not impaired. It is imperative to relieve all pull or tension upon the suture line and to accomplish this the stomach is sutured to the parietal pleura, and the edges of the diaphragm are fastened to the gastric antrum. Novocaine is injected into the phrenic nerve to produce temporary immobilization of the diaphragm. There is still no unanimity of opinion as to whether or not closed suction drainage

should be instituted. If this is desired, however, a catheter is brought out through a short incision posteriorly in a lower interspace. I have been using a "T" tube for this suction, placing one limb upward and the other below the lung and toward the mediastinum. The lung is fully expanded and an airtight closure of the chest completes the operation. The stomach now forms an intrathoracic "esophagus" and its blood supply is derived from the right gastric and the right epiploic arteries. On the esophageal side, when the anastomosis is made in the region of the aortic arch, the blood supply to the esophagus is derived from those vessels which descend from the inferior thyroid artery.[17]

Much of the success or failure of this procedure depends upon the postoperative care. The lung must be kept re-expanded and atelectasis avoided, if possible. Inspissated mucus readily leads to the development of atelectasis which in turn results in pneumonitis. Chemotherapy, early ambulation, breathing exercises, bronchoscopy and food and fluid balance all play their specific roles in the successful outcome of these cases.

Lewis[18] prefers a right transpleural approach for lesions in the middle third of the esophagus for the following reasons:

1) Only the vena azygos major has to be divided to fully expose the esophagus.
2) Greater accessibility to the upper two-thirds of the thoracic esophagus.
3) The aortic arch and descending aorta instead of being an obstacle become a safety barrier between the surgeon and the other pleural cavity.

However, Nissen[19] in a personal communication to the author has stated that he continues to utilize a left sided approach for these lesions.

Treatment of Zone 3 Lesions

Although no hard and fast set of rules can be applied in every case, most lesions involving the lower part of the esophagus as well as the cardiac end of the stomach can be removed through a combined thoraco-abdominal approach. Marwedel,[20] Hedblom[12] and Micheli[22] all had this idea in mind. Humphreys[16] in a personal communication to Garlock mentioned the simplicity of the combined thoraco-abdominal approach. Garlock in turn reported his results with this type of incision in 14 cases, and has become quite enthusiastic about it.

Case Report:

The following case is a typical example of a patient with a Zone 3 lesion:

The patient, W. L., a 65 year old white male, entered the hospital on May 12, 1947, complaining of difficulty in swallowing, which was of five months duration. He stated that food of solid consistency had become more difficult to swallow and that he was now living on liquids. There was some anorexia, nausea, eructation and his dysphagia was becoming rapidly worse. Some vomiting of undigested food was also present. In the past four months he had lost 29 pounds. Temperature, pulse and respirations were normal and the blood pressure was 132/80. The physical examination was essentially normal. X-ray examination revealed a constriction at the lower end of the esophagus, the exact nature of which could not be determined. The esophagoscopist's report showed that the upper esophagus was filled with fluid and undigested food; the distal esophagus was obstructed at a point 42 cms. from the upper gums. A friable freely bleeding and ulcerating lesion was found at this point. A number 10 bougie was passed into the stomach, but the esophagoscope could not be advanced into the stomach. Macroscopic impression was carcinoma of the esophagus, however, the tissue removed for biopsy revealed an adrenocarcinoma. This report suggested a carcinoma of the cardiac end of the stomach which had invaded the esophagus. A partial gastrectomy and esophagectomy were done followed by an intrathoracic esophagogastric anastomosis. The pathologist reported an adenocarcinoma of the cardiac end of the stomach with extension into the esophagus. The technic of the operative procedure is described below.

This man's postoperative course was completely uneventful. On his second postoperative day his temperature rose to 101 degrees F. and then rapidly dropped and remained normal. Daily postoperative chest x-ray films revealed a mild fibrous pleuritis with a small pleural effusion in the lower left chest and a small pneumothorax. However, breath sounds returned immediately and at no time was any dyspnea present. The absence of pain was a striking factor throughout his entire course. He was out of bed on the third postoperative day and was discharged on the 11th postoperative day. At present he is still gaining weight and is now eating a liberal diet.

Treatment:

Intratracheal positive pressure anesthesia is the one of choice. The patient is placed on his right side with about a five degree inclination backwards. The right knee is bent and the pelvis is strapped to the table. Wide adequate skin preparation and draping are essential to good exposure. Scratch marks identify the seventh, eighth, ninth and tenth left costal cartilages. A left upper rectus incision is made, which extends from or below the umbilicus to the left costal arch (Figure 3). The peritoneal cavity is entered and a thorough exploration done to determine the extent of the growth, fixation to vital structures and the presence of metastases (liver, peripancreatic, pelvic and diaphragm). Should the tumor prove to be operable, the incision is extended over the costal arch and then upward and outward in the seventh intercostal interspace. I have found the seventh interspace preferable to the eighth, since it affords better exposure and makes the performance of

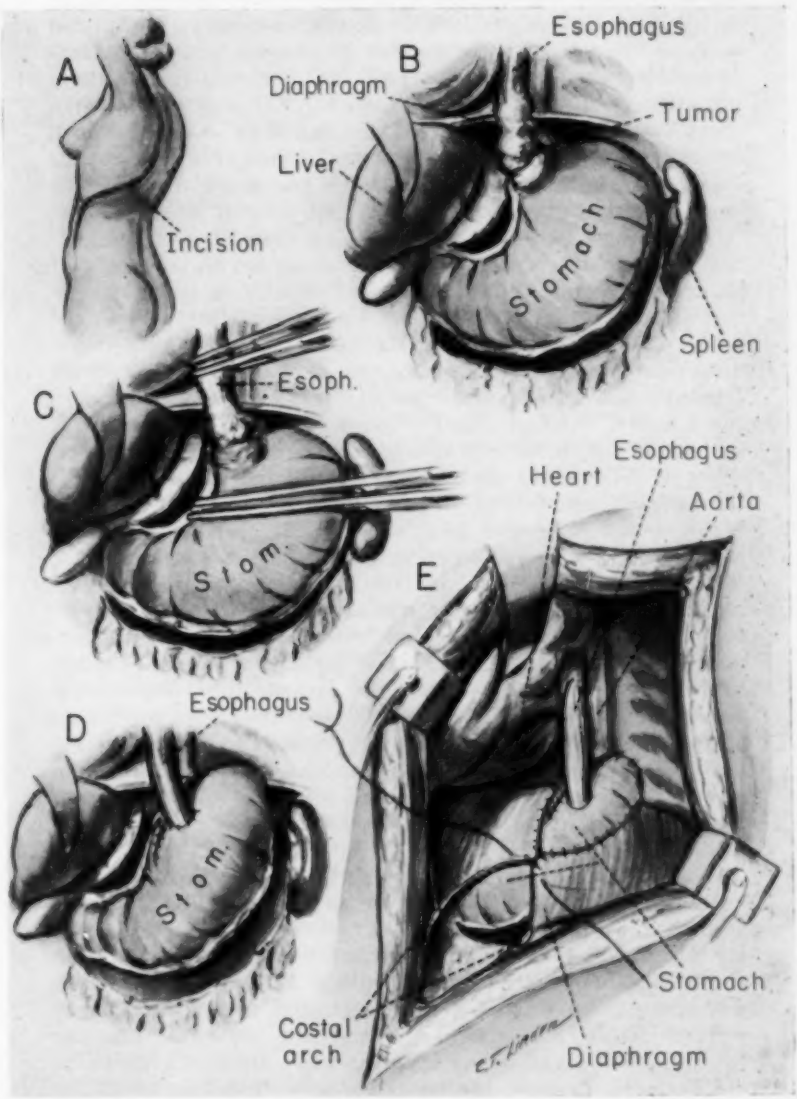

FIGURE 3: The Surgical Treatment for Carcinoma of the Lower End of the Esophagus. — (A) The combined thoraco-abdominal incision. — (B) The diaphragm is split and the stomach is mobilized. — (C) The extent of resection. — (D) The completed anastomosis. — (E) Repair of the diaphragm and the costal arch.

the anastomosis easier. The costal arch is cut and the pleural cavity is entered. The intercostal muscles and pleura are divided back, well past the inferior angle of the scapula, and the left leaf of the diaphragm is severed. The latter is divided radially from the esophageal hiatus to its peripheral rib attachment. Large phrenic vessels are encountered which should be properly isolated, divided and tied. The inferior pulmonary ligament is severed; this exposes an esophageal triangle which is bounded in front by the heart, behind by the descending aorta and below by the diaphragm. In this triangle the esophagus can be easily identified. Truesdale[23] has described this anatomic triangle as an aid in locating diaphragmatic hernias. I have also used it in locating the esophagus in transthoracic vagotomies.[24]

The technic for the resection and anastomosis is essentially the same as that described under Zone 2 lesions. However, this anastomosis would be infra-aortic as compared to the other which is supra-aortic. Through this incision it is possible to resect the spleen and tail of the pancreas with ease, and even a total gastrectomy followed by an esophagojejunostomy becomes possible through it. Carter[25] recently has commented upon the excellent exposure and ease with which splenectomy can be performed through a thoracico-abdominal approach. Closure is accomplished, the diaphragm is repaired, and the now somewhat enlarged esophageal hiatus is sewn to the transplanted stomach. Large perichondral or pericostal sutures are placed. A Bailey rib approximater draws the costal cartilages together and relieves the tension so that the perichondral sutures may be tied. Before the chest is closed, a rubber tube is inserted in a lower interspace for underwater drainage. The pleura, intercostal muscles and overlying soft tissues are approximated. The abdominal incision is closed in layers. The necessity of a jejunostomy is still subject to much controversy; however, I have found this procedure to be unnecessary.

It is interesting to recall that this type of anastomosis, theoretically at least, should predispose to the formation of peptic ulcer of the esophagus, since the two conditions which frequently are associated with such a lesion, namely a short esophagus and an intrathoracic stomach (diaphragmatic hernia), are artificially produced. Oddly enough I have been unable to find such ulcers reported following this procedure and it is my belief that the cutting of the vagus nerves which is necessary in the course of this operation prevents the formation of such lesions.

The suture material which I prefer is spool cotton.[26-29] In an extensive and time consuming procedure such as this, continuous catgut is used only to close the thoracic and abdominal defects.

I have never had cause to regret the combined use of cotton and catgut in the same case nor do we hesitate to use cotton on the mucous membrane side of an anastomosis.

I agree with Garlock that the smoother and more rapid postoperative course of these patients, as compared to those who have had rib resection, is impressive. The patient herein described was dangling his feet out of bed on the first postoperative day, was out of bed on the third, and walked out of the hospital on the 11th postoperative day.

SUMMARY

1) A zoning of the esophagus into three divisions has proved helpful and practical as an aid to standardizing the surgical treatment for carcinoma of the esophagus, and has been applied in a personal series of 71 cases.

2) Typical case histories of Zone 2 and Zone 3 lesions and their surgical management have been cited.

3) Lesions involving Zone 2 (midthoracic esophagus) are best treated by transthoracic partial esophagectomy and partial gastrectomy with a supra-aortic esophagogastric anastomosis.

4) Zone 3 lesions (lower esophagus and cardiac end of the stomach) are best resected by a combined thoracolaparotomy incision which does not necessitate the removal of any rib or ribs.

5) A modification of the standard incisions is suggested.

6) With the advent of positive pressure anesthesia in the hands of qualified anesthetists, chemotherapeutic agents, expert pre- and postoperative care, and the perfection of surgical technic, such extirpations are made possible, thus providing a new lease on life for these patients who only a few years ago were considered doomed.

RESUMEN

1) Una división del esófago en tres zonas ha sido útil y práctico para estandardizar el tratamiento quirúrgico del carcinoma del esófago y se ha aplicado en una serie personal de 71 casos.

2) Se citan casos típicos de lesiones y su tratamiento en las zonas 2 y 3.

3) Las lesiones localizadas en la zona 2 (esófago medio-torácico) son mejor tratadas por la esofaguectomía transtorácica parcial y gastrectomía parcial con anstomosis esofagogástrica supra-aórtica.

4) Las lesiones de la zona 3 (esófago inferior y extremo cardíaco del estómago) son resecadas mejor por una toracolaparotomía que no requiere resección de costilla alguna.

5) Se sugiere una modificación de las incisiones estandar.

6) Con el advenimiento de la baronarcosis en manos de anestesistas calificados, los agentes chimioterápicos, el cuidado experto

del pre y postoperatorio y la perfección de la técnica quirúrgica, tales extirpaciones se han vuelto posibles y se proporciona así a los enfermos antes considerados perdidos, una prolongación de su vida.

RESUME

1) La division de l'oesophage en trois zones parait utile et pratique pour standardiser le traitement du cancer de l'oesophage. L'auteur l'a appliquée dans une série de 71 cas.

2) Il cite des observations typiques de localisation dans les zones 2 et 3 avec leur traitement.

3) Le meilleur traitement des atteintes de la 2ème zone (partie moyenne du thorax) est l'oesophagectomie et la gâstrectomie partielle avec anastomose gastroesophagienne supraaortique.

4) Pour les lésions de la 3ème zone (partie inférieure de l'oesophage et région du cardia) il vaut mieux pratiquer la résection par une incision thoraco-abdominale qui ne nécessite pas d'ablation costale.

5) L'auteur propose une modification des incisions classiques.

6) Ces exérèses sont maintenant possibles grâce à l'anesthésie en pression positive donnée par des anesthésistes qualifiés, grâce aux agents chimiothérapiques, grâce aux agents chimiothérapiques, grâce aux perfectionnements de la technique chirurgicale. Ainsi on a pu permettre de vivre à des malades qui, il y a peu d'années, étaient irrémédiablement condamnés.

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A Simple Method for Differential Block-Inflation in Anesthesia for Lung Surgery*

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The problem of suppurative spill-overs, spreads, and control of cystic fluid and secretions in lung surgery has preoccupied most anesthetists and surgeons in that field.

Beecher[1] has called attention to the gravity of the problem. Many types of bronchial blocks have been devised for that purpose, but all have certain drawbacks.[2-6]

We have tried a Magill block, Thompson's block, Endobronchial intubation with unilateral anesthesia. In each case there were certain difficulties which induced us to manufacture our own block.

Ideal Qualifications for an Endobronchial Block:

1) Block should be easily introduced with least possible trauma to the mucosa of the tracheobronchial tree.

2) Remain securely in place when once introduced.

3) Tight fitting balloon to avoid side leaks.

4) To be able to block selectively affected segments and keep the normal unaffected parenchyma in functioning order. This would imply great technical difficulties, especially when upper lobes are affected.

Endobronchial Blocks Used at the Present Time have the Following Drawbacks:

1) Multiple manipulatory procedures necessitating the use of a bronchoscope, followed by direct vision laryngoscopy for the introduction of the endotracheal tube. The procedure is thus rendered tedious, traumatic, with the constant danger of temporary deficient oxygenation during the procedure. There is always the risk of dislodging the block while manipulating the bronchoscope, also while introducing the endotracheal tube.

2) Once the block has been set in place, it cannot be shifted during the course of operation, should it have been set in the wrong position.

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The endobronchial block we wish to present has the following advantages:

A) The block is introduced blindly through the endotracheal tube, this technique limits the number of manipulations and no bronchoscope is needed. Once the patient has been intubated by direct laryngoscopy, the block is introduced through its lumen. There is little risk of dislodging the block once it's placed within the main bronchus.

B) The endotracheal tube is securely fixed to the face of the patient by adhesive tape, and the block is fixed to the T connection on the endotracheal tube by a rubber cap or stopper.

C) To determine the area blocked, the terminal balloon is inflated, the chest movements are observed. The exact position for the block may be set after the thorax has been opened, by deflating the terminal balloon and either pushing the block further along the bronchus or withdrawing it slightly, it may be thus set into exact position. The procedure needs strict cooperation between surgeon and anesthetist.

D) As the block is a double lumen Miller-Abbott tube, one part of the tube is used for the inflation and deflation of the terminal balloon, the other part is used for suction or inflation of the area of lung below the level of the block.

To obtain inflation of lung distal to the block, a Y connection is introduced on the gas lead from the anesthetic machine to the carbon dioxide absorber. One end of the Y is connected to the suction-inflation part of the block. By keeping the pressure within the rebreathing bag between 6 to 12 centimeters of water pressure, there is a minimal mediastinal shift. All portions of lung below the level of the block are thus kept partially functioning and inflated. This procedure is specially adapted for upper lobes, in which case the balloon acts as a tampoon on the draining bronchus, and the lower lobes are kept functioning by the inflation-deflation and suction portion of the block. In case operative procedures are carried on the lower lobes, the block is pushed into the lower portions of the bronchus, the balloon blocks the draining bronchus, and the part can be drained by applying suction to the second portion of the block, the inflation-suction portion.

We have been able with this system of selective blocking and inflation to operate selected portions of lobes with great security. Segmental resection is rendered a more or less easy procedure, while the remaining portions of lung are kept in function.

We have on record now over 25 cases operated with this procedure. One of our last cases was an abscess cavity in the apical

FIGURE 1: *Above:* Block. *Below: Endotracheal cuffed tube.*

FIGURE 2: Block within endotracheal tube. (1) Baloon inflation part. (2) Suction—inflation part. (3) Connection to gas machine.

portion of the left lower lobe. (The whole procedure has been filmed on 16 mm. film, for demonstration).

Preparation of the Bronchial Block:

Forty centimeters of double lumen Miller-Abbott tubing are taken (Pilling manufacture, Miller tube 11, HF 16 Fr.). For descriptive purposes we shall devide the tube into: (1) Distal, (2) Proximal parts. (The proximal part being the end next to the patients face, towards the anesthetic machine).

1) Distal Part: We have two systems (A) Suction-inflation and (B) Balloon.

(A) Suction-inflation: A multi-perforated metal olivary tip is introduced. We have been using the olivary delivered with the Miller-Abbott tube.

(B) Balloon: (1) Throughout the whole length of the "M-A"* a stainless steel metal rod is introduced. This rod fits loosely in the tube to allow inflation and deflation of the balloon. (Dimensions of rod about 0.7 mm. thick, 1.6 mm. wide and 40 cms. long). This rod remains permenantly in the tube, it gives rigidity and shape to the block.

(2) A small opening is made in the outer wall of the "M-A" about 1 centimeter from the distal end. This will allow air to be injected into the balloon.

(3) Six centimeters of finest Penrose tubing are taken (7 mm.

*"M-A" will stand for Miller-Abbott double lumen tube.

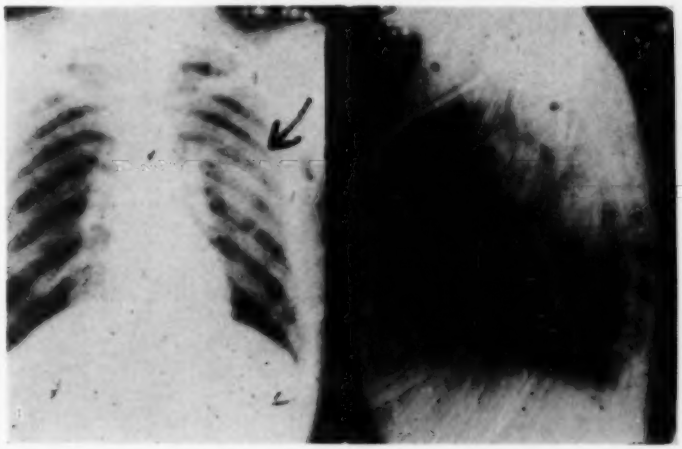

FIGURE 3: *Left:* X-ray of patient. *Right:* Abscess apex cavity, left lower lobe.

FIGURE 4

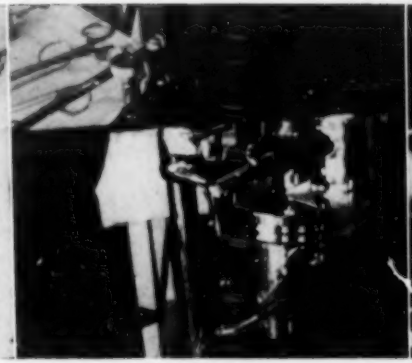

FIGURE 5

FIGURE 6

Figure 4: Introducing block to left bronchus.—*Figure 5:* "Y" connection on gas lead.—*Figure 6:* Upper segment of left lower lobe not inflating; the rest of the lower lobe inflated.

diameter). Half of the Penrose tube is slipped on the distal end of the "M-A," the other half is allowed to outdistance the tube.

(4) A strong tie is placed on the terminal end of the "M-A." This will securely fix, (a) the olivary tip on the suction-inflation part; (b) the metal rod within the balloon part of the "M-A"; (c) the distal portion of the balloon, making the balloon of the tube air tight.

(5) The remaining half of the Penrose tube is now reflected on itself on the "M-A." The two edges of the Penrose tube are now stuck to the "M-A" tube with rubber solution, and a few turns of thin thread will make the balloon air tight and securely fixed.

The proximal end of the block is now passed through a perforated rubber cap, or rubber stopper which fits over the T connection on the endotracheal tube.

2) Proximal End: The proximal end is fitted on to a double lumen metal attachment. We use the metal attachment delivered with the "M-A." The balloon is carefully checked before use.

After careful preliminary study of the area to be blocked, the normal anatomy and the configuration of the tracheobronchial tree from the x-ray film of the patient's chest, the block is now bent at its distal end to fit the anatomy of the area. The block will retain its configuration and angulation by virtue of the steel rod within, which at the same time renders the block rigid and manageable.

Introduction of the Block:

After the patient has been intubated with the largest possible cuffed Magill tube, the proper angle is given to the distal portion of the block. The block, marked in centimeters, is introduced through the endotracheal tube, the olivary tip pointing towards the bronchus to be blocked. It is introduced blindly into the main bronchus to the distance required. The terminal balloon is inflated

FIGURE 7: Local anesthetic spray.

FIGURE 8: Manipulation of spray.

and the chest expansions watched. The balloon may be deflated, and the block further adapted as may seem necessary.

Once the block is approximately in the desired area it is then fixed to the T connection of the endotracheal tube. The position is further checked when the thorax is opened.

The tracheobronchial tree can be aspirated throughout the operation by a silk woven bronchial catheter introduced on and off as may be required, through the T connection of the endotracheal tube, either by detaching the anesthetic machine connection to the endotracheal T, or by delicately removing the rubber cap fixing the block to the endotracheal T connection.

We do not advise the use of this procedure of blocking bronchi with our type of bronchial block in children. In case of pneumonectomy, decided beforehand, we prefer the use of endobronchial anesthesia on the unaffected lung.

Other Technical Points in Our Anesthetic Procedures for Lung Surgery:

A) *Use of antihistaminics:* We have been using 100 milligrams of "Benadryl" solution with the first 500 cc. of blood during venoclysis for supportive and replacement therapy.

The use of antihistaminics greatly diminish serum reactions which pass unnoticed due to general anesthesia.[7,8] This procedure might conceivably improve collateral ventilation and maintain a better capillary tonus.[9]

Postoperative pulmonary collapse and atelectasis may greatly be diminished.[10] We find its use of special interest when dealing with Hydatid disease to check anaphylactic shock.

Bronchiolar spasms, at times encountered with the administration of Curare greatly diminishes effective respiratory gaseous exchange, and is effectively checked by antihistaminics.[11,12]

B) *Pressure spray for local anesthesia:* We have been using a Sparklet dental spray, gas under pressure is supplied by a carbon dioxide capsule; a DeVilbis spray is attached to the dental spray. This is manipulated like a pistol with one hand. The tip of the DeVilbis spray can be directed up, down or straight. One hand manipulates the spray while the other is free to hold the tongue or control the head of the patient.

The solution we used for spraying the larynx and the tracheobronchial tree is a 0.75 per cent Amethocaine with 0.25 per cent Antistine solution. We use Antistine (antihistaminic) to potentiate the local anelgesic effect on the mucous membrane, diminish bronchiolar spasm and postoperative allergic edema of the larynx.[13]

With this technique we have been able to intubate all our patients while conscious.

SUMMARY

I. A home made bronchial block:
   1) Easily introduced through the endotracheal tube, non-traumatic, easily fixed and manipulated.
   2) Permits, at will, differential inflation of lobes and some segments, as well as suction.
   3) Spill-over of secretions, cyst fluid and blood, are reduced to a minimum.
   4) Allows a greater amount of functioning parenchyma.

II. Antihistaminics are routinely used in conjunction with continuous venocylsis of blood and artificial serums.
   1) Serum reactions are reduced to a minimum.
   2) Specially adapted to prevent anaphylactic shock in hydatid disease of the lung.

III. The use of a new type of pressure spray for local anesthesia of the pharynx and tracheobronchial tree.

RESUMEN

I. Un bloque bronquial:
   1) Fácil de introducir a través del tubo endotraqueal, no traumático, fácil de fijar y manipular.
   2) Permite, a voluntad, inflación diferencial de lóbulos y algunos segmentos, tanto como succión.
   3) Se reduce al mínimo el derrame de secreciones, fluído quístico y sangre.
   4) Permite un área mayor de parénquima funcional.

II. Se usan antihistamínicos rutinariamente, junto con venoclisis continua de sangre y sueros artificiales.
   1) Se reducen al mínimo las reacciones al suero.
   2) Adaptado especialmente a evitar el choque anafiláctico en la enfermedad hidátidica del pulmón.

III. El uso de un nuevo tipo de rociador con presión para la anestesia local de la faringe y del árbol tráqueobronquial.

RESUME

I. Un appareil de blocage intra-bronchique fabriqué dans le service même:
   1) Introduit facilement à travers le tube endotrachéal, non traumatisant, facilement disposé et manipulé.
   2) Permet, à volonté, l'insufflation des différents lobes et de quelques segments, aussi bien que l'aspiration.
   3) Les déchets de sécrétions bronchiques, le liquide ou le sang provenant de cavités, sont réduits au minimum.
   4) Permet l'utilisation au maximum de la fonction pulmonaire.

II. L'auteur utilise habituellement les antihistaminiques concuremment à l'injection intra-veineuse permanente de sang et de sérum artificiel.
   1) Les réactions sériques sont réduites au minimum.
   2) Et plus particulièrement le choc anaphylactique est évité dans les kystes hydatiques du poumon.

III. Utilisation d'un nouveau type de pulvérisateur à pression pour l'anesthésie locale du pharynx, et de l'arbre trachéobronchique.

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Tuberculous Tracheobronchitis*

A Review of 100 Cases†

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Tuberculous tracheobronchitis is by no means a new clinical entity as it was first described by Carswell in 1838 and by Louis in 1844 following their discovery of the condition at autopsy. It was not, however, until the bronchoscopists began to visualize the condition and co-relate their findings with the clinical picture that the condition began to assume its true importance, mainly during the past 10 to 15 years. The first case of tuberculous tracheobronchitis discovered bronchoscopically at the Nova Scotia Sanatorium was some 12 years ago.

The present paper is an analysis of the findings during the bronchoscopic examination of 527 tuberculous patients who were bronchoscoped 953 times in the course of the discovery and treatment of 100 cases of tracheobronchitis.

Myerson[6] states that the infection progresses from a parenchymal lesion by way of a bronchiole, along the smaller bronchial branches until it reaches the main bronchus and even the trachea; or it may develop by the penetration of a tuberculous caseous gland into the lumen of a bronchus; or by extension of the infection via the lymphatics. The first stage is a submucous infiltration which causes elevation and oedema of a mucous membrane. The condition may remain as such or granulation tissue may break through and an ulceration result. The tuberculous process extends to form granulation tissue which may be sufficiently exuberant to cause atelectasis. This granulation tissue involving the surface of the bronchi may go on to caseous degeneration, especially in the terminal stages of the disease when it may be very extensive and involve the bronchi and trachea from the lung focus to the glottis. As healing occurs in any of its phases, varying degrees of fibrosis develop causing from minute scarring of a bronchus to complete stenosis. Sweeney[7] favors the theory of the development of the condition by the direct implantation of tubercle bacilli upon the mucosa.

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†Presented at the Refresher Course for Health Officers, Nova Scotia Sanatorium, January 13, 1951.

Incidence

McIndoe[4] found tuberculous tracheobronchitis in 15 per cent of 272 routine sanatorium admissions bronchoscoped. Sweeney[7] has stated that most reported figures above 15 per cent include cases selected for reasons of some suspicious clinical findings. He reported finding 56.5 per cent gross tracheobronchitis in 667 tuberculous cases coming to autopsy. Estimated microscopic bronchial lesions in the remainder raised the overall percentage to 72, with an increasing incidence in young age groups and in females. After weighing all evidence, he concluded that few far advanced cases of pulmonary tuberculosis are entirely free from tracheobronchial lesions, especially after a rigid microscopic search. It must be remembered, however, that the pathologist sees the terminal stages of the condition, whereas the bronchoscopist sees it in its varied earlier phases.

Holinger and Johnson[1] report an incidence of 10 to 15 per cent tracheobronchitis in routine bronchoscopy, rising to 60 per cent in cavity cases. They state also that one in 10 cases of primary infection type of tuberculosis show tracheobronchitis.

In this series, 19 per cent of the cases bronchoscoped showed this complication but it must be remembered that many were selected because some clinical aspect of the case made us suspect its presence.

It is to be noted that 18 of the cases were males and 82 were females (Table I). This represented a sex incidence of those bronchoscoped of 7.5 per cent and 29 per cent respectively, and is in keeping with our previously reported[5] finding of a preponderant incidence of the condition in females in the ratio of 4:1 to males.

Our youngest case was seven years of age and our oldest 64. The remaining cases were distributed in the intervening years with a preponderance in the third and fourth decades.

The cases in this series were tabulated according to the classification of Judd[3] except that his Group I and Group II have been called Group A and B respectively in order to avoid confusion with Type I and Type II (Table I).

Group A: Extrabronchial lesions resulting from a rupture of a caseous lymph gland or a cavity into a bronchus or the trachea. Two of our cases, both male, belonged to this group.

Group B: Intrabronchial lesions.

Type I: The lesions consist of a superficial inflammatory reaction and may be progressing to show a superficial ulceration. Twenty-four cases were of this type.

Type II: Definite ulceration of variable size and number is

present with some surrounding inflammatory reaction and even granulation overgrowth. Fifty-three cases were of this type.

Type III: More extensive ulceration is present than in Type II and there is fixation of the surrounding tissue and masses of granulation tissue or even actual beginning stenosis. Sixteen cases were of this type.

Type IV: The ulceration has healed and the inflammatory reaction has subsided but actual stenosis is present. These are considered as healed lesions. Five cases were of this type.

Type V: Miliary implantations on the mucosa. None of our cases were so classified.

Of the 100 cases reported eight were relapses in persons previously treated with apparent complete disappearance of the lesion bronchoscopically (Table II). Four of the persons relapsed once and two relapsed twice.

The bronchi only were involved in 87 cases, the trachea apparently alone in three, whereas both the trachea and bronchi combined were involved in 10. Of the 16 Type III cases, nine involved both the trachea and bronchi whereas only one out of the 53

TABLE I. Age and Sex Distribution According to Type of Tracheobronchitis Present.

Age Group	GROUP A	GROUP B (MALE)					GROUP B (FEMALE)				
		Type I	II	III	IV	Total	Type I	II	III	IV	Total
0- 9*	1	0	0	0	0	1	0	0	0	0	0
10-19	1	0	0	0	0	1	5	3	0	0	8
20-29	0	1	4	0	0	5	8	17	6	1	32
30-39	0	2	1	0	0	3	3	14	7	3	27
40-49	0	3	2	1	0	6	0	8	2	1	11
50-59	0	2	0	0	0	2	0	3	0	0	3
60-69**	0	0	0	0	0	0	0	1	0	0	1
All Ages	2	8	7	1	0	18	16	46	15	5	82

* Youngest 7 years of age. ** Oldest 64 years of age.

TABLE II: Recurrence of Tracheobronchitis in Persons Previously Treated Satisfactorily with Complete Clearing of Original Lesion as Seen Bronchoscopically.

	Type I	Type II	Type III	Type IV	All Types
Relapsed Once	1	2	1	0	4
Relapsed Twice	0	1	1	0	2
Total Relapses	1	4	3	0	8

Type II cases involved both. It would seem logical, of course, that the more advanced the bronchial lesion, the more extensive it would be (Table III).

It is well to remember that the sputum is not always positive in the presence of tuberculous tracheobronchitis, either because the lesion is healed (Type IV) or stenosis has prevented the expectoration of sputum from the involved segment or because the bacilli are present in too few numbers to be demonstrated. More rigorous search in the last mentioned condition will be rewarded by positive cultures in nearly every case. In this series, 87 per cent of the cases had positive sputum at the approximate time of the diagnosis of the tracheobronchitis. It is to be noted that only one out of the five Type IV cases had positive sputum. If this type is excluded from the group, over 90 per cent were positive for tubercle bacilli (Table IV).

When physical examination of the chest reveals the presence of localized rhonchi, either constant or inconstant, or when the patient complains of subjective wheezing, or when the x-ray film shows the presence of atelectasis, either segmental, lobar or massive, in a tuberculous patient, it is quite probable that tuberculous tracheobronchitis is a complication of the disease. When all three are present in the one patient it is an almost certainty.

Table V reveals the fact that rhonchi and wheezing were apparently present more frequently among the females than among

TABLE III: Situation of Lesion Related to Type.

Region Involved	Number	GROUP A	GROUP B			
			Type I	Type II	Type III	Type IV
Bronchi	87	2	23	50	7	5
Trachea	3	0	1	2	0	0
Both	10	0	0	1	9	0
Total	100	2	24	53	16	5

TABLE IV: Sputum Status When Diagnosis of Tracheobronchitis Made.

	Positive for T.B.	Negative for T.B. (Culture)	Total
GROUP A	0	2	2
GROUP B			
Type I	24	0	24
Type II	48	5	53
Type III	14	2	16
Type IV	1	4	5
ALL TYPES	87	13	100

the males. These findings occurred with increasing frequency as one advanced from Types I to IV of Group B regardless of the sex. Fifty per cent of all cases presented these findings.

Atelectasis showed the same general incidence as rhonchi and wheezing, although to a slightly lesser degree. Forty-six per cent of the cases showed this complication (Table VI).

One hundred per cent of the Type IV cases presented either rhonchi, wheezing or atelectasis, and they occurred in over 93 per cent of the Type III cases and over 70 per cent of the Type II cases. The over all incidence of one or more of these findings in all types was 70 per cent (Table VII).

Table VIII indicates the extent of the atelectasis found as related to the type of tracheobronchitis present. The segmental patchy types of atelectasis were most frequently seen with the less severe types of tracheobronchitis whereas the lobar and mas-

TABLE V: Rhonchi and Subjective Wheezing Related to Type of Tracheobronchitis.

Tracheobronchitis	MALE			FEMALE			BOTH SEXES		
	Cases	*	Per cent	Cases	*	Per cent	Cases	*	Per cent
GROUP A	2	0	0	0	0	0	2	0	0
GROUP B									
Type I	8	1	12.5	16	5	31.3	24	6	25.0
Type II	7	3	42.9	46	25	54.3	53	28	52.8
Type III	1	1	100.0	15	11	78.3	16	12	75.0
Type IV	0	0	0	5	4	80.0	5	4	80.0
ALL TYPES	18	5	27.7	82	45	54.8	100	50	50.0

* Rhonchi or Wheezing.

TABLE VI: Atelectasis Related to Type of Tracheobronchitis.

Tracheobronchitis	MALE			FEMALE			BOTH SEXES		
	Cases	*	Per cent	Cases	*	Per cent	Cases	*	Per cent
GROUP A	2	2	100.0	0	0	0	2	2	100.0
GROUP B									
Type I	8	1	12.5	16	8	50.0	24	9	37.5
Type II	7	3	42.8	46	20	43.5	53	23	43.4
Type III	1	0	0.0	15	8	53.3	16	8	50.0
Type IV	0	0	0.0	5	4	80.0	5	4	80.0
ALL TYPES	18	6	33.3	82	40	48.8	100	46	46.0

* Atelectasis.

sive types were more likely to be seen in the more severe grades of tracheobronchitis.

The extent of the parenchymal lesion at the time that the diagnosis of tracheobronchitis was made is indicated in Table IX. As might have been anticipated, the bronchial disease was more apt to be associated with the more advanced parenchymal lesions, although the findings in the moderately and far advanced groups do not differ greatly as far as Types II and III are concerned. It should be mentioned that 30 per cent of the cases of tracheobronchitis were found in thoracoplasty failures, and the presence of this condition should always be suspected under such circumstances.

The treatment results in this series and the time intervals required for the results to be noted are indicated separately for Group B Types I, II, and III, in Tables Xa, Xb, and Xc. Type IV, representing the healed condition, of course, was not treated.

The topical application of silver nitrate was used principally

TABLE VII: Presence of Rhonchi and/or Subjective Wheezing and/or Atelectasis Related to Type of Tracheobronchitis Present.

Tracheobronchitis	MALE			FEMALE			BOTH SEXES		
	Cases	*	Per cent	Cases	*	Per cent	Cases	*	Per cent
GROUP A	2	2	100.0	0	0	0	2	2	100.0
GROUP B									
Type I	8	1	12.5	16	9	56.2	24	10	41.7
Type II	7	5	71.4	46	33	71.7	53	38	71.7
Type III	1	1	100.0	15	14	93.3	16	15	93.8
Type IV	0	0	0.0	5	5	100.0	5	5	100.0
ALL TYPES	18	9	50.0	82	61	74.4	100	70	70.0

* All or Any of Above Findings.

TABLE VIII: Extent of Atelectasis Related to Type of Tracheobronchitis.

Tracheobronchitis	Cases	Segmental	Lobar	Massive	Atelectasis (All Degrees)
GROUP A	2	0	2	0	2
GROUP B					
Type I	24	4	5	0	9
Type II	53	11	9	3	23
Type III	16	1	4	3	8
Type IV	5	0	0	4	4
ALL TYPES	100	16	20	10	46

for those cases seen before the advent of streptomycin. It was used in strengths of 15 to 30 per cent, mainly the latter, and was usually applied at monthly intervals. Twenty-three patients were so treated with complete disappearance of the visible tracheobronchitis in 17 (74 per cent). Eight (47 per cent) of these required over six months treatment to bring about this result.

Forty-nine Group B cases were treated with streptomycin alone, or more recently, with streptomycin and para-aminosalycylic acid. In 43 of the 47 cases in which the outcome is known, there was complete clearing of the visible lesion, and presumably, clearing of the remaining invisible lesion beyond the visual field of the bronchoscope. This is a recovery rate of 92 per cent, with 35 cases (74 per cent) clearing in less than three months.

Five cases were treated with both streptomycin and silver nitrate with good results in four.

Of the two cases which became worse under streptomycin treatment both had open cavities and advanced disease. Two cases classified as "Result Not Stated" under streptomycin treatment were not bronchoscoped upon completion of treatment but are well and working four and six years later.

It is to be noted that none of the 24 Type I cases went on to bronchial stenosis as far as is known (Table Xa); seven (15 per cent) of the 46 Type II cases in which the outcome is known went on to stenosis (Table Xb); and seven (58 per cent) of the twelve Type III cases in which the results are known went on to bronchial stenosis (Table Xc). This occurred in spite of the type of treatment administered but did not occur as frequently in the streptomycin cases as in those treated by silver nitrate.

Of the streptomycin cases that relapsed, all responded to second or third courses of streptomycin, even though they had previously received courses of not less than 50 grams of the drug and some-

TABLE IX: Extent of Parenchymal Lesion Related to Type of Tracheobronchitis.

		MINIMAL		MOD. ADV.		FAR ADV.		PRI. INF.	
	Cases	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
GROUP A	2	0	0.0	1	50.0	0	0.0	1	50.0
GROUP B									
Type I	24	1	4.2	10	41.6	13	54.2	0	0.0
Type II	53	1	1.9	30	56.6	22	41.5	0	0.0
Type III	16	1	6.2	7	43.8	8	50.0	0	0.0
Type IV	5	0	0.0	1	20.0	4	80.0	0	0.0
ALL TYPES	100	3	3.0	49	49.0	47	47.0	1	1.0

TABLE Xa: Treatment Results—Type I Tracheobronchitis.

RESULT	TREATED WITH STREPTOMYCIN —Treatment Interval in Months—						TREATED WITH SILVER NITRATE —Treatment Interval in Months—						TREATED WITH BOTH Interval			NO TREATMENT Interval	
	No.	<1 mo.	>1<2	>2<3	>3<6	+6	No.	<1 mo.	>1<2	>2<3	>3<6	+6	No.	>3<6	+6	No.	+6
Disappeared	14	2	6	5	1		2	1				1	0			0	
Improved	0						0						0			1	1
Stationary	0						0						0			0	
Worse	1			1			0						0			0	
Stenosed																	
Not Stated	0						0						0			6	
TOTAL	15						2						0			7	

TABLE Xb: Treatment Results—Type II Tracheobronchitis.

Disappeared	27	4	7	9	4	3	11		2	3		6	2	1	1	2	2
Improved	1					1	2				1	1					
Stationary																	
Worse	1			1													
Stenosed					1	1						3		1			1
Not Stated	2															5	
TOTAL	31						13						2			7	

TABLE Xc: Treatment Results—Type III Tracheobronchitis.

Disappeared	2		1	1			4		1		2	1	2		2		
Improved	1	1											1	1			
Stationary							1		1								
Worse							1				1						
Stenosed		1	1						2		1	1		1			
Not Stated	0						2									2	
TOTAL	3						8						3			2	

times 100 grams. Streptomycin sensitivity tests were not carried out on these cases. Two of the relapsed silver nitrate cases responded to second courses of this agent.

Both cases of Group A, extrabronchial type, were treated with streptomycin with x-ray evidence of improvement but a persisting sinus and granulating tissue remained after many months.

It is to be mentioned that recurrences were not always at the same site as the original bronchial lesion. One patient had an open cavity at the top of the left lung under a thoracoplasty. She was seen to have a bronchial lesion, Type II, of the left main bronchus in January, 1950. This disappeared in less than two months under streptomycin treatment. It recurred in the right main bronchus in July and again responded to streptomycin so that it was no longer seen a month later. In November it recurred in the left main bronchus and trachea but again cleared in less than a month under streptomycin. Lobectomy has since been performed and hence it is hoped that the source of her recurrences has been removed thereby.

Comment

Tuberculous tracheobronchitis is a frequent complication of parenchymal pulmonary tuberculosis. It is often the cause of unsatisfactory results from collapse measures. It can occur in the absence of any demonstrable x-ray lesion of the lungs. It should be suspected when physical examination reveals the presence of localized rhonchi or the patient complains of wheezing or when the x-ray reveals the presence of atelectasis or when the sputum remains positive in spite of a lesion healed from an x-ray point of view or in spite of a mechanically satisfactory collapse procedure. The proved presence of a persisting cavity or bronchiectasis under thoracoplasty does not eliminate the possibility of the presence of tracheobronchitis as well. All such patients should be bronchoscoped.

There are no contraindications to bronchoscopy other than an active tuberculous laryngitis, a stenosed larynx which will not admit the bronchoscope without tearing, the patient with such a low vital capacity that he cannot be expected to stand a mild reaction from the local anaesthetic used, the moribund patient, or the one who is haemorrhaging from a tuberculous parenchymal lesion. In such a patient, after the haemorrhage stops, bronchoscopy may be undertaken with safety or if localization of this bleeding is important, he may even be bronchoscoped while haemorrhaging.

Where the tuberculous disease is active or where there is clinical evidence strongly suggestive of the presence of a tuberculous

tracheobronchitis, it is well to administer a course of streptomycin for a few days prior to the bronchoscopic examination as this will help to prevent any spread of disease which might otherwise be initiated thereby.[5]

Streptomycin is the treatment of choice, combined with PAS. It is preferred to silver nitrate as it is effective in a shorter period of time, it is accompanied by less bronchial stenosis and it reaches the bronchial lesions beyond the field of vision of the bronchoscope which silver nitrate cannot do. When exuberant granulations are bothersome, a combination of both forms of treatment may be helpful.

Dilatation of stenosed bronchi is rarely indicated and may be definitely harmful. It has been known to reactivate a quiescent bronchial lesion. It may have to be undertaken, however, if stenosis and ultimate occlusion of a bronchus or the trachea threatens life.

It is possible that some of our relapses under streptomycin treatment might not have occurred had we not attempted to use the drug for the minimum length of time with the thought that we were saving it for some later emergency and minimizing the development of streptomycin resistance. Now that we know that PAS will delay the development of this resistance, it seems feasible and desirable never to give less than 50 grams of streptomycin, one gram per day combined with up to 14 grams of PAS, once tuberculous tracheobronchitis is diagnosed. Indeed, longer courses of treatment will often be indicated.

Whenever possible, an active parenchymal lesion should be controlled by some collapse measure at the same time that the tracheobronchitis is being treated. A pulmonary resection may be required for this purpose. The removal of the parenchymal focus or its control will do much to prevent recurrences of the tracheobronchitis.

SUMMARY

An analysis of 100 cases of tuberculous tracheobronchitis diagnosed bronchoscopically has been presented. They have been grouped according to the classification of Judd. The incidence, relevant symptoms and appropriate treatment of the condition have been discussed.

RESUMEN

Se presenta un análisis de 100 casos de tuberculosis traqueobrónquica. Se han agrupado de acuerdo con la clasificación de Judd. La incidencia, síntomas destacados y el tratamiento adecuado se discuten.

RESUME

Les auteurs rapportent l'analyse de 100 cas de tuberculos trachéobronchique diagnostiquée par la bronchoscopie. Ces cas ont été groupés selon la classification de Judd. Lls discutent la fréquence, les symptômes essentiels, et le traitement propres à ces affections.

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Further Studies on the Control of Vestibular Toxic Effects of Streptomycin by Dramamine*

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In our previous article we stated that dramamine (dinenhydrinate) afforded symptomatic relief of the dizziness which is encountered during streptomycin therapy and we voiced the belief that dramamine might prevent the toxic effects of streptomycin on the vestibular apparatus. At this time we wish to report our further work on this subject.

Evidence continues to appear in the literature indicating the success of dramamine in controlling motion sickness.[5] The usefulness of this drug in other conditions in which the vestibular apparatus seems to be affected, such as the nausea of pregnancy,[3] radiation sickness,[1] migraine,[2,7] and the nausea of aureomycin therapy,[8] among others, is borne out by many authors.

Reports on the toxic effects of streptomycin are less numerous and this evidently is due to smaller doses of the drug being used. Glorig[6] believes that irreversible changes in both divisions of the eighth nerve are produced by amounts of more than one gram per day, and Carr, et al.[4] state that neurotoxic reactions to streptomycin might be avoided or minimized by keeping the maximal concentration in the blood stream at less than 50 micrograms per cubic centimeter.

It still is debatable whether the lesion in the vestibular apparatus is peripheral or central. Winston and his co-workers,[10] in continuing their experimental work on cats, again conclude that the lesion is central, while Glorig[6] believes that it is in the end organ. The central site seems to be the most logical from the work of Schiff, et al.[9] The effects produced in their experimental animals by di-isopropyl fluorophosphate are similar to those occurring in streptomycin toxicity, and the fact that local application of the drug did not produce forced circling movements, while injections into the blood did, favors this theory. These workers believed that

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dramamine exerted its effect, because of its atropine-like properties, by its antagonistic action against an excess amount of acetylcholine produced by the di-isopropyl fluorophosphate in the brainstem. Winston and his collaborators[11] confirmed this in their experiments on normal human subjects, showing that dramamine counteracts the emetic action of morphine, perhaps by virtue of the fact that it may be an antiacetylcholine agent.

Our present study concerns 54 patients admitted to the tuberculosis service of this hospital, twenty-six of whom were given streptomycin in a dosage of 1 gram a day for periods of 21 to 120 days, with an average of 70.3 days, along with 150 mgm. of dramamine daily for the duration of therapy. None of these patients complained of dizziness during the course of treatment, and the audiometric and caloric stimulation tests made after the cessation of therapy, and 90 days later, did not show any essential change over those made before streptomycin was begun. The eosinophiles in the blood averaged 2.8 at the beginning of therapy, 7.1 during the middle of their course, and 4.1 at the close.

Twenty-eight patients were given 1 gram of streptomycin daily for 30 to 120 days, with an average of 65.1 days. Of these, four (14.2 per cent) who received the drug for an average of 97 days, complained of dizziness from seven to 44 days after therapy was begun, with an average of 21.5 days. Dramamine was given in a dosage of 150 mgm. a day and symptoms disappeared in from three to 20 days, with an average of 10 days. None of these patients showed any deviation from the pre-treatment audiometric or caloric findings. The eosinophiles in this group averaged one at the onset of therapy, 3.5 at the time dizziness began, and 2.2 at the end. The remaining 24 patients exhibited no symptoms during treatment, and the cochlear and vestibular findings showed no changes. The eosinophiles averaged 3.5, 5.1, and 4.2 respectively.

Discussion

While it is impossible to state how many patients who were receiving dramamine would have complained of dizziness if the drug had not been given, we believe that the same percentage would have been found as was observed in the other group. We feel that this symptom was prevented by the use of dramamine. The absence of toxicity, as far as the cochlea and vestibule are concerned, in the group who did not receive dramamine at any time, is due, we believe, to the smaller amount of the drug being used at the present time. Our previous statement that there was not an allergic reaction to streptomycin is borne out by the eosinophile determinations.

SUMMARY

In view of the work which has shown that dramamine is an antagonist of acetycholine and since it is likely that streptomycin is a cholinergic agent, we believe that when streptomycin is administered dramamine should be given also, to eliminate any toxic effects on the vestibular apparatus.

RESUMEN

En vista del trabajo que ha demostrado que la dramamina es un antagonista de la acetilcolina y puesto que posiblemente la estreptomicina es un agente colinérgico, creémos que la dramamina debe administrarse también para eliminar los efectos tóxicos sobre el aparato vestibular.

RESUME

Etant donné qu'il a été démontré que la dramamine est un antagoniste de l'acétycholine, et étant donné ce qu'on sait de l'action physiologique de la streptomycine, les auteurs pensent qu'il faut associer la dramamine à l'administration de streptomycine pour éviter les actions toxiques sur l'appareil vestibulaire.

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Spontaneous Pneumothorax Due to Diaphragmatic Defect Complicating Pneumoperitoneum Therapy

Report of a Case

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Complications which occasionally occur in pneumoperitoneum have been reported by different authors.[1-22] Mellies[14] in 1939 described a case of right sided pneumothorax in a 16 year old female as a result of a perforation of a tuberculous lesion of the diaphragm. Smith[21] in 1943 reported a death from bilateral pneumothorax during a diagnostic pneumoperitoneum. Necropsy of his case revealed small defects connecting the peritoneal with both pleural cavities. Air entering the pleural cavity from the peritoneum by migrating along the mediastinal structures have been described by Simmonds,[20] Moyer,[13] Banyai[3] and others. Lumsden[12] recently described a case of pneumothorax complicating artificial pneumoperitoneum in a 38 year old woman. He believed that air entered the pleural cavity from the peritoneum through a pleuro-peritoneal canal.

Case History

L.J.B., No. 7726: Negro male, 21 years of age, was admitted to the Veterans Administration Center, Temple, Texas, on May 31, 1948, for treatment of pulmonary tuberculosis with symptoms of two months duration. A marginal pneumothorax on the left side was induced in April 1948 (Figure 1).

Physical examination revealed a well-developed and well-nourished Negro male who did not appear acutely ill and the positive findings in this case were limited entirely to the chest. The serology, urinalysis and complete blood count on admission were essentially negative; sputum examinations were continuously positive for acid-fast bacilli; initial roentgenogram of the chest revealed about 30 per cent collapse of the left lung with a patent cavity in the dorsal division of the lower lobe. The right lung was clear and well-aerated.

The pneumothorax on the left side was discontinued as ineffective on July 16, 1948, and pneumoperitoneum, supplemented with left phrenic crush, was instituted. Bronchoscopy showed evidence of tuberculous bronchitis and a 42 day course of streptomycin therapy of 0.5 grams daily, was begun July 29, 1948. Because of relapse of the endobronchial

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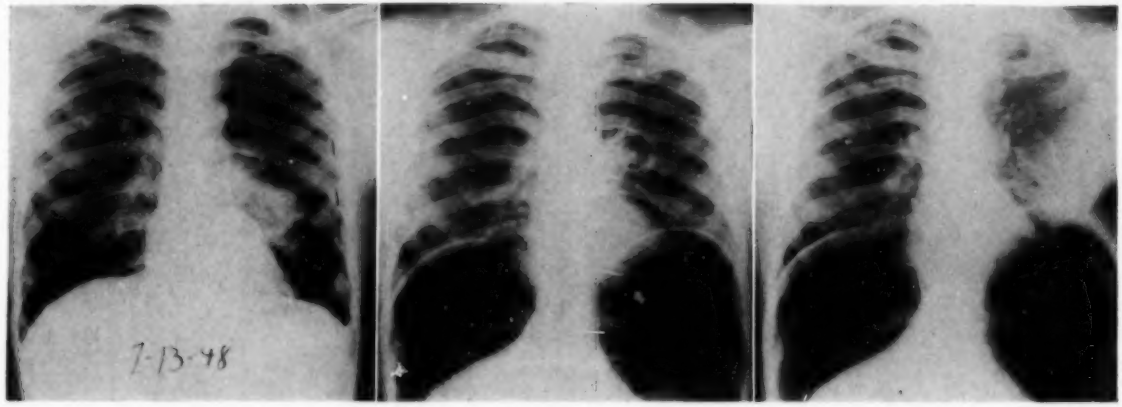

FIGURE 1 FIGURE 2 FIGURE 3

Figure 1: Roentgenogram, taken after admission, showing marginal pneumothorax, left, with an open cavity in the lower lobe.— *Figure 2:* Roentgenogram taken April 8, 1949, showing extensive pneumoperitoneum. Pulmonary cavity still open. — *Figure 3:* Postoperative film after resection of the left lower lobe and partial thoracoplasty.

disease, he was given a second course of streptomycin with the dosage increased to 1 gram daily for an additional 42 days. The cavity in the dorsal division of the lower lobe, however, remained in tension and did not respond to the induced collapse, as well as to the antibiotic therapy (Figure 2).

A resection of the left lower lobe with partial thoracoplasty was performed on April 13, 1949. The postoperative course was uneventful except for transient atelectasis of the right upper lobe. Pneumoperitoneum was continued, with weekly refills of approximately 1,200 cc. of air (Figure 3).

On August 25, 1949, the patient received a refill of 1,050 cc. of air in the peritoneal cavity with a final reading of plus 18. In the morning of August 29, 1949, he experienced a sudden pain in the right side of the chest with dyspnea. In a matter of a few minutes he became orthopneic, pulseless and almost moribund. Examination of the chest revealed marked hyperresonance to percussion on the right side with displacement of the heart to the left. Immediately 2,700 cc. of air were removed and supportive treatment was given. His pulse promptly improved, consciousness was restored and recovery ensued. Fluoroscopy revealed 30 per cent collapse of the right lung with markedly diminished pneumoperitoneum in comparison with the previous examinations. A tube, connected with a water trap, was inserted into the right pleural cavity and after 72 hours the right lung re-expanded and the tube was removed (Figure 4). Following this complication, pneumoperitoneum was continued cautiously with small refills at frequent intervals.

On September 13, 1949, a few hours following a refill, he again experienced the same signs and symptoms as above and the same result followed deflation. Fluoroscopy as well as x-ray inspection (Figure 5) again showed a decrease in the amount of pneumoperitoneum and marginal pneumothorax on the right side. It was decided, therefore, to discontinue pneumoperitoneum and an attempt was made to continue with right pneumothorax. Thoracoscopy was done on October 12, 1949, and the adhesions were found to be unseverable. An attempt was made to inspect the possible defect in the right side of the diaphragm, but the patient became progressively dyspneic, necessitating discontinuance of thoracoscopy and immediate withdrawal of air from the right pleural space.

In view of the above complications, it was decided to discontinue for the time being every type of collapse therapy and the patient was placed on strict bed rest regime alone. He continued to improve, sputum became negative for acid-fast bacilli in smears, cultures and guinea-pig inoculation, and he was discharged August 25, 1950, as an arrested case of pulmonary tuberculosis (Figure 6).

Discussion

There is no question that our patient had a leakage of air from the peritoneal cavity into the right pleural space. A thorough check on any possible breach in technique did not reveal any accountable errors. An attempt, however, to visualize the right diaphragmatic defect through the thoracoscope was unfortunately unsuccessful because of the increased dyspnea.

There was no reverse flow of air, probably because of lack of negative pressure in the peritoneal cavity, lack of positive pressure

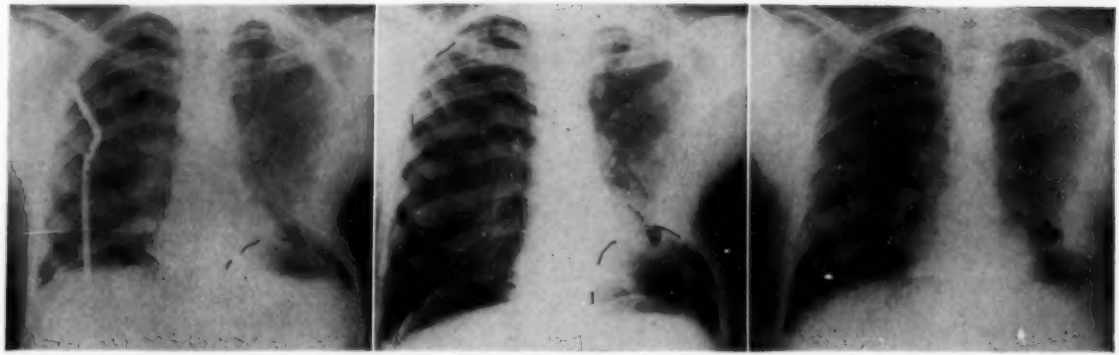

FIGURE 4 FIGURE 5 FIGURE 6

Figure 4: Note catheter in the right pleural cavity and loss of pneumoperitoneum.— *Figure 5:* Note pneumothorax and adhesions on the right side.—*Figure 6:* Roentgenogram of the chest prior to discharge.

in the pleural cavity, pressure of the liver on the diaphragm, and a possible check-valve-like defect in the diaphragm.

SUMMARY

1) A case of spontaneous pneumothorax occurring during pneumoperitoneum therapy is described.

2) Congenital diaphragmatic defect was apparently the cause of leakage of air from the peritoneal cavity into the right pleural space.

RESUMEN

1) Se describe un caso de neumotórax espontáneo que ocurrió durante el tratamiento con neumoperitoneo.

2) Aparentemente la causa del paso del aire de la cavidad peritoneal a la pleural, fué un defecto congénito del diafragma.

RESUME

1) L'auteur rapporte un cas de pneumothorax spontané survenant au cours d'un traitement par pneumopéritoine.

2) Une brèche congénitale du diaphragme était apparemment l'origine du passage de l'air de la cavité péritonéale dans la plèvre droite.

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Editorial

In this issue of *Diseases of the Chest*, Captain Steinberg and collaborators present one of the most important subjects in diagnosis and control of tuberculosis. Finding tubercle bacilli in secreta or excreta of persons with symptoms or demonstrable lesions has long been regarded as the last court of appeal in diagnosis. This is still true, but only after one has proved that acid-fast bacilli are tubercle bacilli and that they emanated from the body of the person under study.

During the past decade or so, there has been an unfortunate practice of making etiological diagnoses only from shadows of lesions seen on x-ray films. This was a general practice before large numbers of clinicians protested on the ground that x-ray shadows are not pathognomonic. With mass chest x-ray surveys getting under way in the 1920's and becoming extensively used in the past few years, many apparently healthy persons have had shadow-casting lesions demonstrated which were reported as tuberculous and treatment was recommended. However, students of this disease have constantly demanded that the only two phases of the examination specific for tuberculosis be employed for every person with shadow-casting lesions. These are the tuberculin test and the recovery of tubercle bacilli. Individuals who react to tuberculin have at least primary lesions somewhere in their bodies and the shadow-casting lesions under consideration may be tuberculous. On the other hand, individuals who fail to react to tuberculin properly administered with reference to technique and dosage with well known exceptions do not have primary tuberculosis complexes and therefore lesions under consideration are nontuberculous.

It is strongly recommended that sputum specimens, gastric or bronchial washings be carefully examined for acid-fast bacilli and other micro-organisms as well as malignant cells of all persons who have shadow-casting lesions. It often becomes necessary to obtain, through the bronchoscope, tissue and bronchial aspirations for study.

Captain Steinberg and co-workers have called attention to three principal sources of error in the examination of material for tubercle bacilli, the first being acid-fast saprophytes which cannot be differentiated from tubercle bacilli by microscopic inspection. Formerly, upon seeing acid-fast bacilli in smears, most laboratories reported tubercle bacilli present. Now, when laboratories report just that acid-fast bacilli are present, it is unfortunate that many physicians interpret this as indicating tubercle bacilli have been found. Therefore, they promptly report such cases to health

authorities and all too often recommend treatment for tuberculosis with no other evidence.

Approximately two decades ago, in a single year one physician stated that he sent 18 persons to sanatoriums who did not react to tuberculin, with or without x-ray shadows, but acid-fast bacilli were reported in their sputa. Not one of these cases was found to have tuberculosis. Under sanatorium management, symptoms promptly subsided and x-ray shadows disappeared as they would have if the individuals had remained at home. At the same time, other physicians were having similar experiences. Thus it is obvious that only seeing acid-fast bacilli in smears does not justify a diagnosis of any condition. In all such cases, suspected material should be planted in culture medium and preferably inoculated into guinea pigs to determine with certainty whether the acid-fast bacilli are pathogenic.

Captain Steinberg and co-workers call attention to pathogenicity of acid-fast organisms being erroneously reported from guinea pig inoculations. This is not an uncommon experience and is usually due to cross-contamination and faulty methods of technicians. Therefore, a single positive inoculation does not always prove that the material collected from a given individual is that inoculated or that it contains tubercle bacilli.

The third chief source of error quoted by these authors results from "human frailty." Inadequate training or experience of a technician may cause reporting of acid-fast bacilli when the objects viewed belong to some other category. Mislabeling specimens in original containers or slides after smears are made is a common source of error. Unclean glassware, use of tap water, etc., may lead to errors in laboratory reports.

All too often, following the detection of shadow-casting lesions in clinics, surveys and the like, health authorities give little or no consideration to the possibility of laboratory errors. Persons with acid-fast bacilli reported in gastric washings, etc., are often promptly labeled contagious without confirmatory evidence and are urged and occasionally forced to enter institutions. Obviously, unless acid-fast organisms can be proved to be tubercle bacilli, a great deal of harm may be done the individual, the institution, the community, and the cause of tuberculosis control itself.

For these reasons it is strongly recommended that every person with shadow-casting lesions be carefully examined and observed by physicians qualified to properly evaluate all phases of the examination and who draw no conclusion without adequate evidence.

J. A. M.

Annual Meeting, Board of Governors

The annual meeting of the Board of Governors of the College was held at the Ambassador Hotel, Atlantic City, New Jersey, on Thursday, June 7, 1951. The following Governors of the College were in attendance at the annual meeting:

William R. Rumel, Salt Lake City, Utah, Chairman
Robert J. Anderson, Washington, D. C.
Carl C. Aven, Atlanta, Georgia
Gerald Beatty, Wilmington, Delaware
Otto C. Brantigan, Baltimore, Maryland
Charles A. Brasher, Mt. Vernon, Missouri
Sidney A. Britten, Washington, D. C.
Alfred A. Busse, Jefferson, Wisconsin
George C. Crump, Asheville, North Carolina
Arthur W. Dahlstrom, Rapid City, South Dakota
Edgar W. Davis, Washington, D. C.
Max Fleishman, Omaha, Nebraska
Burgess L. Gordon, Philadelphia, Pennsylvania
Charles L. Harrell, Norfolk, Virginia
George Foster Herben, Yonkers, New York
David W. Heusinkveld, Cincinnati, Ohio
Willard B. Howes, Detroit, Michigan
Robertson O. Joplin, Louisville, Kentucky (alt.)
George R. Maxwell, Morgantown, West Virginia
Elliott Mendenhall, Dallas, Texas
Frank A. Merlino, Providence, Rhode Island
Arnold Minnig, Denver, Colorado
Herman J. Moersch, Rochester, Minnesota
Jerome V. Pace, New Albany, Indiana
Charles K. Petter, Waukegan, Illinois
Jaime F. Pou, Hato Rey, Puerto Rico
J. J. Quinlan, Kentville, Nova Scotia
Howell Randolph, Phoenix, Arizona
Robert E. Schwartz, Hattiesburg, Mississippi
Clarence M. Sharp, Jacksonville, Florida
Robert M. Shepard, Tulsa, Oklahoma
Kenneth A. Tyler, Gooding, Idaho
Buford H. Wardrip, San Jose, California
David H. Waterman, Knoxville, Tennessee
Francis J. Welch, Portland, Maine
Irving Willner, Newark, New Jersey
Roy A. Wolford, Washington, D. C.

The agenda for the annual meeting of the Board of Governors was as follows:

1) Opening Remarks,
William R. Rumel, Salt Lake City, Utah, Chairman,
Board of Governors.
   a) Signing of College Register by Governors.
   b) Introduction of Governors.
   c) Introduction of Guests.

2) The Editorial Policy of *Diseases of the Chest*,
Jay Arthur Myers, Minneapolis, Minn., Chairman, Editorial Board.

3) What are we doing to improve the teaching of chest diseases in our medical schools?,
Edward W. Hayes, Monrovia, California, Chairman, Council on Undergraduate Medical Education.

4) Our expanding postgraduate program,
J. Winthrop Peabody, Washington, D. C., Chairman, Council on Postgraduate Medical Education.

ANNUAL MEETING, BOARD OF GOVERNORS, AMERICAN COLLEGE OF CHEST PHYSICIANS

5) Keeping abreast with the newer concepts in the management and treatment of diseases of the chest,
Edwin R. Levine, Chicago, Illinois, Chairman, Council on Management and Treatment of Diseases of the Chest.

6) Sanatorium standards as approved by the American College of Surgeons and the American College of Chest Physicians,
Russell S. Anderson, Erie, Pennsylvania, Chairman, Council of Tuberculosis Hospitals.

7) Report of the Joint Committee on Chest X-ray of the American College of Radiology and the American College of Chest Physicians.
Robert J. Anderson, Washington, D. C., Chairman, Council on Public Health.

8) Survey of penal and mental institutions for chest pathology,
Otto L. Bettag, Chicago, Illinois, Chairman, Committee on Chest Diseases in Institutions.

9) Routine chest x-ray examination in general hospitals—The utilization of beds in general hospitals for tuberculosis,
James H. Stygall, Indianapolis, Indiana, Chairman, Council of Tuberculosis Committees.

10) Report of the Joint Committee on Industrial Chest Diseases of the American Association of Industrial Physicians and Surgeons and the American College of Chest Physicians,
Louis L. Friedman, Birmingham, Alabama, Chairman, Committee on Industrial Diseases of the Chest.

11) The College Prize Essay Contest,
Eli H. Rubin, Bronx, N. Y., Chairman, Committee on College Essay.

12) Our International Program,
Andrew L. Banyai, Milwaukee, Wisconsin, Chairman, Committee on Scientific Assembly, Council on International Affairs.

13) Report of the Membership Committee,
Chevalier L. Jackson, Philadelphia, Pennsylvania, Chairman, Committee on Membership.

14) The role of the Governors in our expanding College program,
Louis Mark, Columbus, Ohio, President, American College of Chest Physicians.

Dr. Robert E. Schwartz, Hattiesburg, Governor of the College for the State of Mississippi, was elected a member of the Committee on Nominations. The Board of Governors re-elected Dr. William R. Rumel, Salt Lake City, Utah, as the Chairman of the Board.

Meeting adjourned.

POSTGRADUATE COURSE IN DISEASES OF THE CHEST

A Continuation Course in Diseases of the Chest will be given at the University of Minnesota Center for Continuation Study, Minneapolis, on October 18, 19 and 20. This course is given with the sponsorship of the Minnesota Chapter of the American College of Chest Physicians and the Minnesota Trudeau Society. Emphasis will be placed on the diagnosis and treatment of the most important chest diseases. Visiting faculty members include Dr. William E. Adams, Professor of Surgery, University of Chicago Medical School; Dr. Robert G. Bloch, Chief of the Pulmonary Division of the Montefiore Hospital, New York City; and Dr. O. A. Sander, Marquette University Medical School, Milwaukee. For further information please address Dr. George W. Aagaard, Director, Department of Continuation Medical Education, 3330 Powell Hall, University of Minnesota Medical School, Minneapolis 14, Minnesota.

CONVOCATION, 17th ANNUAL MEETING, AMERICAN COLLEGE OF CHEST PHYSICIANS

Members of the College who received their Fellowship Certificates at the Annual Convocation held at the Ambassador Hotel, Atlantic City, New Jersey, June 9, 1951.

New Fellows of the College

The following physicians received their Fellowship Certificates at the Convocation ceremony of the College held in Atlantic City on June 9, 1951. A photograph of the group appears on the opposite page.

Herbert D. Adams, Boston, Massachusetts
Sergius V. Algin, Hamburg, Pennsylvania
Milton W. Anderson, Rochester, Minnesota
V. Thomas Austin, Urbana, Illinois
John A. Baird, Lake City, Florida
Ivan D. Baronofsky, Minneapolis, Minnesota
Edmund G. Beacham, Baltimore, Maryland
Elston L. Belknap, Milwaukee, Wisconsin
Gabriel Bondi, Milwaukee, Wisconsin
Daniel C. Braun, Pittsburgh, Pennsylvania
Joseph Breuer, Brooklyn, New York
Edward G. Cada, Selfridge, Michigan
Irving Cheifetz, New York, New York
Sylvia Cheng, Weston, West Virginia
John L. Chesnut, Rome, Georgia
Johnson C. S. Chu, Weston, West Virginia
William C. Clyne, New York, New York
Samuel Cohen, Jersey City, New Jersey
B. J. Cronwell, Austin, Minnesota
S. Eugene Dalton, Atlantic City, New Jersey
Horace DeLien, Washington, D. C.
William E. Denman, Memphis, Tennessee
Maurice A. Donovan, Schenectady, New York
James Duncan, Livermore, California
William E. Dyko, Chicago, Illinois
Frederick J. Ebstein, Canton, Ohio
Joseph L. Ecker, Bayonne, New Jersey
Benjamin L. Ellwood, Bayonne, New Jersey
Walter L. Evans, White Plains, New York
James E. Fell, Fall River, Massachusetts
Jean-Marie Filiatrault, Montreal, Canada
Max A. Forse, Martinsburg, West Virginia
Eric M. Found, Charlottetown, P.E.I., Canada
Stephen Fromer, Staten Island, New York
Isabelle T. Gadzikowski, Grand Rapids, Michigan
Frank A. Gagan, Poughkeepsie, New York
Nathan Goldstein, New Orleans, Louisiana
Irving Graber, Belmar, New Jersey
Frederick Gruneck, Chicago, Illinois
Alfred M. Hicks, Verona, New Jersey
Phillip W. Horn, Jacksonville, Florida
Stello Imprescia, Louisville, Kentucky
Daniel E. Jenkins, Columbus, Ohio
Nathan K. Jensen, Minneapolis, Minnesota
Boyce E. Jones, London, Kentucky
John L. Keeley, Chicago, Illinois
Albert Kimpton, Mont-Joli, Canada
George O. Kress, Columbus, Ohio
Albert E. Krieser, Anoka, Minnesota
Alexander E. Lapp, Nova Scotia, Canada
Richard H. Lawler, Chicago, Illinois
Milton I. Levine, New York, New York
Nochim Lewin, St. Agathe, Canada
Meyer R. Lichtenstein, Chicago, Illinois
Arthur J. Logie, Miami, Florida
Clark W. Mangun, Washington, D. C.
Chester Markwood, Columbus, Ohio
Arthur M. Master, New York, New York
Hector Martinez de Alva, Tijuana, Mexico
George McCracken, Kingston, Canada

William P. McHugh, Cambridge, Massachusetts
George S. McReynolds, Galveston, Texas
Herman P. Miller, Newark, New Jersey
Isidore Miller, New York, New York
Chih Ming Ling, Worcester, Massachusetts
Roger Mitchell, Trudeau, New York
Leo T. Moleski, Grand Rapids, Michigan
Louis C. Morris, Chicago, Illinois
Howard F. Munro, Freeport, New York
Harry A. Nevel, Jacksonville, Florida
Joseph T. Noe, Chester, West Virginia
John J. O'Keefe, Philadelphia, Pennsylvania
Arthur M. Olsen, Rochester, Minnesota
James J. O'Neil, Omaha, Nebraska
Henry Frazer Parry, Saranac Lake, New York
George Piness, Los Angeles, California
Bernard Pollack, Fort William, Canada
Thomas F. Pugh, Moorestown, New Jersey
Martyn C. Ratzan, Brooklyn, New York
Nathaniel E. Reich, Brooklyn, New York
Wayne A. Reser, Wichita Falls, Texas
Hugh E. Robertson, London, Canada
Arnold J. Rodman, White Plains, New York
Louis C. Roettig, Columbus, Ohio
Irvin E. Rosenberg, Wilkes-Barre, Pennsylvania
Gilmore M. Sanes, Pittsburgh, Pennsylvania
Marshall C. Sanford, Washington, D. C.
Hyman I. Sapoznik, Chicago, Illinois
S. J. Shane, Nova Scotia, Canada
Joseph Schiff, Walla Walla, Washington
Joseph H. Schwab, Woodhaven, New York
Solomon Schwartz, Flushing, New York
William G. Sharpe, London, Canada
Jacob S. Sherson, Malvern, Pennsylvania
Victor Siegel, Red Bank, New Jersey
Sira Sirisumpundh, Bangkok, Thailand
Hyman A. Slesinger, Windber, Pennsylvania
William A. Smith, Raleigh, North Carolina
George E. Spencer, Pittsburgh, Pennsylvania
Henry J. Stanford, Tucson, Arizona
Edward P. Swartz, Scranton, Pennsylvania
Herbert C. Sweet, St. Louis, Missouri
William Taffet, Belleville, New Jersey
Isidore M. Trace, Chicago, Illinois
Albert B. Tucker, Newark, New Jersey
Harold M. Van der Schouw, Wheat Ridge, Colorado
J. Franklin Waddill, Norfolk, Virginia
Harry Warner, New York, New York
Daniel R. Webb, Cedar Rapids, Iowa
Aaron Weiner, Paterson, New Jersey
Merritt B. Whitten, Dallas, Texas
Gertrude H. Wilber, Staten Island, New York
William L. Winters, Highland Park, Illinois
Kenneth A. Wood, Detroit, Michigan
Lawrence E. Wood, Kansas City, Missouri
William A. Zavod, Mount Vernon, New York

Report of the Treasurer

December 31, 1950

INCOME:			
New Membership Fees		$11,646.20	
Dues		59,778.67	
Sales:			
Advertising	$15,653.08		
Subscriptions	13,986.69		
Directory	35.00		
Fellowship Keys	394.76		
Medical Books	1,251.38	31,320.91	
Postgraduate Courses		11,788.78	
Interest, U. S. Savings Bonds		707.50	
TOTAL INCOME			$115,242.06
EXPENSES:			
Salaries		$24,245.06	
Printing of the Journal		28,617.50	
Posting of the Journal		4,389.36	
Editor of the Journal		950.00	
Annual Meeting		6,740.27	
Annual Award		253.58	
Essay Award		250.00	
Membership Certificates		546.86	
International Meeting		5,861.61	
Semi-Annual Meeting, Board of Regents		836.75	
Traveling, Executive Secretary		1,172.65	
Public Relations		1,102.75	
Officers' and Committee		1,828.24	
Secretary to Chairman of Board of Regents		300.00	
President's Secretarial		300.00	
Rent and Electricity		4,347.57	
Telephone and Telegraph		1,678.92	
Postage and Shipping		2,981.93	
Printing and Engraving		2,592.81	
Office		1,761.82	
Library		365.35	
Postgraduate Courses		7,867.77	
Depreciation		564.31	
Audit		225.00	
TOTAL EXPENSES			$ 99,780.11
NET INCOME FOR THE YEAR			$ 15,461.95

Despite the increase in the services rendered to the College members and the added expenses necessary to carry on these services, we are pleased to report that the College closed the year 1950 with a surplus of $15,461.95.

The books were audited by the LaSalle Audit Company of Chicago.

Minas Joannides, Treasurer Benjamin L. Brock, Asst. Treasurer

College Chapter News

MEXICAN CHAPTER

On May 29 the Mexican Chapter of the College met in annual session in Mexico City and the following officers were elected for the year 1951-1952:

Miguel Jimenez, Mexico City, President,
Manuel Alonso, Mexico City, Vice-President,
Jesus M. Benitez, Mexico City, Secretary-Treasurer.

Jesus M. Benitez, Secretary.

NORTH CAROLINA CHAPTER

The North Carolina Chapter of the College will hold its annual meeting on October 31. Two scientific sessions have been arranged, one to be held in the afternoon at the Veterans Hospital, Oteen, and an evening session which will be held in Asheville. The following program will be presented:

Afternoon Session, Oteen Veterans Hospital:

"Case of Cardiac Arrest During Thoracic Surgery: Pathological Report,"
Leo L. Leveridge, Oteen.

"Pulmonary Tuberculosis and Pregnancy,"
C. D. Thomas, Black Mountain.

"Streptomycin Treatment for Tension Cavity,"
Ralph E. Moyer, Oteen.

"Some Observations on Pathogenesis and Healing of Tuberculous Cavities,"
Benjamin Sandler, Oteen.

Evening Session, Asheville:

"The Management of Symptomless Intrathoracic Lesions,"
Paul W. Sanger, Charlotte.

Motion Picture Session:

"Pneumonectomy for Traumatic Stricture of Bronchus,"
"Decortication for Empyema,"
Julian A. Moore, Asheville.

"Excision of Giant Pulmonary Cyst,"
"Excision of Mediastinal Tumor,"
James D. Murphy, Oteen.

James H. Matthews, Chairman, Program Committee,
Leon H. Feldman, Secretary.

WISCONSIN CHAPTER

The annual meeting of the Wisconsin Chapter of the College will be held at the Schroeder Hotel, Milwaukee, on Sunday, September 30. Papers will be presented by Dr. Jay Arthur Myers, Minneapolis; Dr. Chevalier L. Jackson, Philadelphia; Dr. Burgess L. Gordon, Philadelphia; Dr. Joseph Shaiken and Dr. Hans W. Hefke, Milwaukee. The complete program appeared in the August issue of "Diseases of the Chest."

Leon H. Hirsh, Secretary.

SOUTHERN CHAPTER

The Eighth Annual Meeting of the Southern Chapter of the College will be held on November 4 and 5, 1951, in Dallas, Texas. The chapter will meet jointly with the Southern Medical Association meeting, November 5 through 8. The Adolphus Hotel, Dallas, will be headquarters for the meeting of the Southern Chapter of the College. The following program will be presented:

Sunday, November 4th:

Morning Session

Alfred Goldman, St. Louis, Missouri, Chairman

"Chemotherapy in Tuberculosis,"
Carl W. Tempel and Frederic J. Hughes, Denver, Colorado.

"Physiologic Induction of Pneumothorax,"
Leo E. Johns, Jr. and John H. Seabury, New Orleans, Louisiana.

"Segmental Lung Anatomy,"
Bernard Klerman, Baltimore, Maryland.

"Pneumoperitoneum: General Observations and Particular Application to Preparation for Surgery,"
John Chapman and D. O. Shields, Dallas, Texas.

Afternoon Session

John S. Harter, Louisville, Kentucky, Chairman

"Resection in Pulmonary Tuberculosis,"
F. H. Alley and Francis Cole, Memphis, Tennessee.

"Streptokinase-Streptodornase (SK-SK) in Inflammatory Diseases of the Chest,"
Alfred Goldman and I. Jerome Flance, St. Louis, Missouri.

"Esophageal Achalasia and Hiatus Hernia,"
W. Buford Davis and John S. Harter, Louisville, Kentucky.

"Tumors of the Lung Other than Bronchiogenic Carcinoma,"
Lawrence M. Shefts, San Antonio, Texas.

"Applications of Cine-Radiography in the Diagnosis and Management of Diseases of the Thoracic Viscera,"
H. S. Weems, Frank M. Morgan, J. V. Warren and Osler A. Abbott, Atlanta, Georgia.

Sunday Evening

President's Banquet

Dean B. Cole, Richmond, Virginia, Toastmaster

Presidential Address:

"These Changing Times,"
M. Jay Flipse, Miami, Florida, President,
Southern Chapter, American College of Chest Physicians.

X-Ray Conference,
Hollis E. Johnson, Nashville, Tennessee, Moderator.

Monday, November 5th:

Morning Session

Hollis E. Johnson, Nashville, Tennessee, Chairman

"Palliative Therapy of Inoperable Intrathoracic Malignancies,"
Edward F. Skinner, Memphis, Tennessee.

"Management of Spontaneous Pneumothorax,"
Sheldon E. Domm and David H. Waterman, Knoxville, Tennessee.

"Hemoptysis Without Demonstrable Disease,"
David T. Carr and B. E. Douglass, Rochester, Minnesota.

"Irradiation Fibrosis of the Lungs,"
Sydney Jacobs, New Orleans, Louisiana.

"The Present Status of the Use of ACTH and Cortisone in the Management of Pulmonary Diseases,"
Maurice S. Segal, Boston, Massachusetts.

Luncheon Meeting:

M. Jay Flipse, Miami, Florida, President, Southern Chapter, American College of Chest Physicians, Presiding.

Business Meeting, Southern Chapter:

Reports of Committees.

Election of Officers.

Guest Speaker: R. Lee Clarke, Jr., M.D., Director and Surgeon-in-Chief, M. D. Anderson Hospital for Cancer Research, Houston, Texas.

Unusual cases, diagnosed or not, are acceptable for the X-Ray Conference. Please notify Dr. Hollis E. Johnson, 2122 West End Avenue, Nashville, Tennessee, of the number of films you wish to present.

Duane Carr, Memphis, Tennessee, Chairman, Program Committee,
George R. Hodell, Houston, Texas, Secretary.

College News Notes

Major K. N. Rao, Madras, India, has recently been appointed superintendent of the Government Tuberculosis Sanatorium, Tambaram, Madras, and Professor of Tuberculosis, Stanley Medical College. Major Rao also serves as tuberculosis advisor to the Government of Madras.

Dedication ceremonies and open house at the New Puumaile Hospital, Hilo, Hawaii, were held on July 28, 1951. Dr. William F. Leslie, Governor of the College for Hawaii, is director of the hospital and participated in the Dedication ceremonies. Dr. Hastings H. Walker, Regent of the College for Hawaii, also participated in the ceremonies. Puumaile Hospital, one of the finest modern hospitals in the Territory of Hawaii, has accommodations for 216 patients.

Dr. Allan Hurst has been appointed medical director of the National Home for Jewish Children at Denver, Colorado, for children suffering from asthma and allergic diseases.

The First International Congress on Mass Radiology was held September 1 to 3 at the Sanatorium - Village of Sondalo, Italy. The Congress was sponsored by the High Commissariat of Hygiene and Public Health and organized by the Italian Federation for the Control of Tuberculosis. Professor Giovanni L'Eltore, Rome, is Secretary General of the Federation.

The Argentinian Society of Tuberculosis has announced the election of the following officers for the year 1951-1952: Dr. Rodolfo E. Cucchiani Acevedo, President; Dr. Hernan D. Aguilar, Vice-President; Dr. Bruno Biondini, Secretary; and Dr. Fernando Del Valle, Treasurer.

Obituaries

LESLIE PERCIVAL ANDERSON
1899 - 1950

Dr. Leslie P. Anderson was born in Vincent, Iowa, June 8, 1899. He had his common schooling in Eagle Grove, Iowa and graduated from the high school of Regina, Saskatchewan. His premedical and medical course was taken at the Medical School of the University of Minnesota graduating in 1925. His internship was in the Minneapolis General Hospital.

Dr. Anderson was married to Edith Richards, April 9, 1927. Two sons were born, Richards and Robert. Richards died of poliomyelitis in May 1943; the younger son, Robert, is a talented pianist and is at present taking his premedical course in Willamette University at Salem, Oregon.

Dr. Anderson was diagnostician for the Washington State Tuberculosis League from 1929 to 1931, resigning this position at that time to take postgraduate work at the Phipps Institute in Philadelphia until 1932.

In 1934 he accepted the position of Medical Director of Oakhurst Sanatorium in Elma, Washington, where he remained until 1944 when he resigned and went to the University of Minnesota to take postgraduate work in Radiology, completing the course in 1946. In 1947 he came to Yakima, Washington, starting in private practice limited to radiology. Early in May of 1950 he went to the Massachusetts General Hospital in Boston to take a special course in x-ray therapeutics. He completed this course and was returning by airplane to Yakima when the plane crashed in a storm over Lake Michigan with the loss of all on board.

Dr. Anderson was a Fellow of the American College of Chest Physicians and a member of the National Tuberculosis Association and the American Trudeau Society. He was active in the Methodist Church. Had been a member of Kiwanis for sixteen years, being a past-president of the Elma Club. His hobbies were fishing and stamp collecting. He had a cheerful disposition and was most liked by those who associated with him. His tragic death was a great shock to his many friends.

John E. Nelson, Governor for Washington.

MAXWELL DONNELL RYAN
1901 - 1950

Dr. Maxwell Donnell Ryan, who was on the Visiting Staff of the New York Eye and Ear Infirmary since 1939, passed away suddenly at the age of forty-eight at his home in New York City.

Dr. Ryan was born in Leavenworth, Kansas, July 20, 1901, and received his early education at North East High School, Kansas City, Missouri, and his B.A. degree from the University of Kansas, Lawrence, Kansas. He attended McGill University, Montreal, Canada, where he received his Medical Degree in 1927. His basic internships were all served at the Royal Victoria and affiliated hospitals in Montreal, Canada. His training in Otolaryngology was obtained at Bellevue Hospital in New York City.

On January 31, 1934, he entered private practice in New York City and limited his practice to Otorhinolaryngology. He was on the Visiting Staff of Bellevue Hospital, Ear, Nose and Throat Service, from 1934 to 1942, and on his resignation was an Associate Surgeon. He was also on the Visiting Staff of St. Luke's Hospital, Ear, Nose and Throat Service, from 1934 to 1939, as an Assistant Surgeon.

He was a member of the New York State and County Medical Societies, New York Otological Society, Society of the Alumni of Bellevue Hospital. He was a Diplomate of the American Board of Otolaryngology; a fellow of the American Academy of Ophthalmology and Otolaryngology; American Laryngological, Rhinological and Otological Society; American College of Chest Physicians; and American Medical Association. He was Clinical Professor of Otorhinolaryngology, New York University and Bellevue Hospital Medical College.

Dr. Ryan developed the Endoscopic and Laryngeal Surgery Service at the Infirmary such that, at the time of his death, it was second to none in the Country. The postgraduate course he gave in this work to the residents and otolaryngologists from all over the Country ranked with the best obtainable anywhere.

Our College, as well as the Medical Profession in general, through his passing has sustained a tremendous loss.

George Foster Herben, Governor for New York State.

WALTER R. GUMPRECHT
1902 - 1950

Dr. Walter R. Gumprecht, chest specialist, died December 16, 1950, at Bangor, Maine. He was 48 years old. Medical Director of the Bangor Sanatorium, he was a past-president of the Eastern Maine General Hospital staff, a visiting physician at that institution and at the Bangor State Hospital.

He was born in Meriden, Connecticut, March 9, 1902, son of Mr. and Mrs. Richard Gumprecht, and was educated in the New Britain, Connecticut schools. His undergraduate study was done at Tufts Medical College, from which he received his medical degree in 1927.

At the time of his death he held a major's commission in the Medical Detachment, Maine National Guard, having served since April 1929, when he joined as a first lieutenant. He entered Federal service in February 1941, serving until August of the same year. He was city physician of Bangor from 1931 through 1933.

Dr. Gumprecht was a member of the American Medical Association, the Maine Medical Association, the Maine Public Health Service, the Penobscot County Medical Association, the Executive Club, and was a past-president of the Bangor Medical Club. He also was a fellow of the American College of Chest Physicians, consultant for chest diseases at the University of Maine, a member of the board of the Bangor State Hospital, and a director and member of the executive board of the Maine Public Health Association.

At the time of his death he was a member of Bangor Council and commander of St. John's Commandery, Knights Templar. Dr. Gumprecht was a member of St. Andrews' Lodge, Mount Moriah Chapter, R.A.M., Bangor Council, Tamerlane Council, Red Cross of Constantine, Anah Temple, Order of the Mystic Shrine, and Tuscan Chapter, O.E.S. He was a deacon and member of the board of All Souls Congregational church, and was first violinist with the Bangor Symphony Orchestra.

Dr. Gumprecht is survived by his wife, Edith; two daughters, Marjorie C., and June E., two sons, Richard A., and James L., all of Bangor; his parents, Mr. and Mrs. Richard Gumprecht of New Britain, and a sister, Mrs. Mabel Brainard of Rocky Hill, Connecticut.

Francis J. Welch, Governor for Maine.

COLLEGE EVENTS

Interim Session, American College of Chest Physicians, Ambassador Hotel, Los Angeles, California, December 2-3, 1951.

European Chapter Meeting, Paris, France, September 15, 1951.
Chicago Postgraduate Course, September 24-28, 1951.
Michigan Chapter Meeting, Grand Rapids, September 27, 1951.
Wisconsin Chapter Meeting, Milwaukee, September 30, 1951.
Minneapolis Postgraduate Course, October 18-20, 1951.
Portland Postgraduate Course (Oregon), October 29-31, 1951.
North Carolina Chapter Meeting, Asheville, October 31, 1951.
Southern Chapter Meeting, Dallas, Texas, November 4-5, 1951.
New York City Postgraduate Course, November 12-17, 1951.

MEDICAL SERVICE BUREAU

POSITIONS AVAILABLE

Staff physician wanted for 160 bed tuberculosis hospital situated in the Pacific Northwest. Physician should be eligible for Oregon license. Salary $495 to $555 per month with complete maintenance. Full particulars given upon request. Please address inquiries to Box 221A, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

Senior resident physician wanted for 200-bed tuberculosis sanatorium near Philadelphia. Approved A. M. A. Full Maintenance. Salary open. Please address Box 226A, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

Industrial medicine. Iron mining Full time physician. No private practice. No direct responsibility for therapy—medical, surgical, or first aid—*but* supervision of all activities affecting health and hygiene of approximately 5,000 employees in an area with an expanding future. An assistant is needed who must be capable of assuming the direction of this Department of Industrial Hygiene within several years. Suggested qualifications: (1) Background training in chest diseases desirable, (2) 35 to 45 age limits preferable; (3) previous experience in industrial medicine not essential. Salary open. Please address George McL. Waldie, M.D., Director, Cleveland-Cliffs Iron Company, Ishpeming, Michigan.

Assistant medical director for tuberculosis sanatorium in Southwest. Salary $5,000 annually with partial maintenance. Please address Box 229A, American College of Chest Physicians, 112 E. Chestnut St., Chicago 11, Ill.

Senior resident physician wanted for Eastern sanatorium. American graduate with tuberculosis training in American sanatoria including postoperative care of chest surgical cases. Married physician with family accepted. Complete maintenance. State salary desired in first communication. Please address Box 230A, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

Several positions open for chest specialists for tuberculosis hospitals in Florida. Salaries, depending upon experience and training, from $4,200 to $6,000 including house and maintenance. Please address Box 231A, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Ill.

Fellow or resident physician for institution caring for children with

asthma and allergic diseases. Well equipped, well staffed institution, affiliated with medical school. Opportunity for training in institution and university hospital clinics. For further information please write Box 232A, American College of Chest Physicians, 112 East Chestnut St., Chicago 11, Ill.

Assistant medical director for tuberculosis hospital in Ohio. Salary $7000 per year plus furnished house. For further information please write Box 233A, American College of Chest Physicians, 112 East Chestnut St., Chicago 11, Illinois.

POSITIONS WANTED

Young thoracic surgeon, qualified for boards, experienced in all aspects of surgery for pulmonary tuberculosis, including resection, and in cardiovascular surgery, interested in obtaining position with or without general surgery. Please address Box 255B, American College of Chest Physicians, 112 E. Chestnut St., Chicago 11, Ill.

Physician desires residency in tuberculosis hospital or sanatorium. Experienced. For further information please address Box 257B, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

COLLEGE OF TEACHING TUBERCULOSIS PHYSICIANS

The College of Teaching Tuberculosis Physicians of Buenos Aires, Brazil, has announced the election of the following officers for the period 1951-1952:
President, Juan Carlos Rey,
Vice President, Carlos Walter Grobli,
Secretary, Pedro Rubinstein,
Asst. Secretary, Enrique Rodriguez,
Treasurer, Remo Stupenengo,
Asst. Treasurer, Jorge Pilheu,
Directors: Juan Carlos Costa, Jose B. Gomez, Francisco A. Dubra.

ANNUAL MEETING PHOTOGRAPHS

Photographs of the various College functions taken at the annual meeting in Atlantic City are available and may be purchased through the Executive Offices of the College, 112 East Chestnut Street, Chicago 11, Illinois.

COMMERCIAL SOLVENTS ANTIBIOTICS AWARD WON BY TERRAMYCIN RESEARCH GROUP

Commercial Solvents Award in Antibiotics for 1950 was presented tonight at the annual meeting of the Society of American Bacteriologists to the Terramycin Research Team of the Chas. Pfizer and Co., Inc. The Award was presented to Dr. G. L. Hobby who was designated spokesman for the research group.

SANATORIUM DIRECTORY

The sanatoria listed in this section are among the finest sanatoria in the United States. They are prepared to offer private, individual, specialized care to your patients.

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For listings in the SANATORIUM DIRECTORY write to the American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

ALUM ROCK SANATORIUM
San Jose, California

CRAGMORE SANATORIUM
Colorado Springs, Colorado

EUDOWOOD SANATORIUM
Towson, Maryland

MARYKNOLL SANATORIUM
Monrovia, California

PALMER SANATORIUM
Springfield, Illinois

ROCKY GLEN SANATORIUM
McConnelsville, Ohio

ST. JOHNS SANITARIUM
Springfield, Illinois

SOUTHERN SIERRAS SANATORIUM
Banning, California

SOUTHWESTERN PRESBYTERIAN SANATORIUM
Albuquerque, New Mexico

THE SAMUEL AND NETTIE BOWNE HOSPITAL
Poughkeepsie, New York
Immobilizing Lung Chamber Therapy and Other Modern Methods of Treatment

SANATORIO ALBERTAL
Buenos Aires, Argentina

SANATORIO SAN ANGEL
Mexico City, Mexico

SWEDISH NATIONAL SANATORIUM
Englewood (Denver) Colorado
Modern Equipment — Moderate Prices

WORKMEN'S CIRCLE SANATORIUM
Liberty, New York

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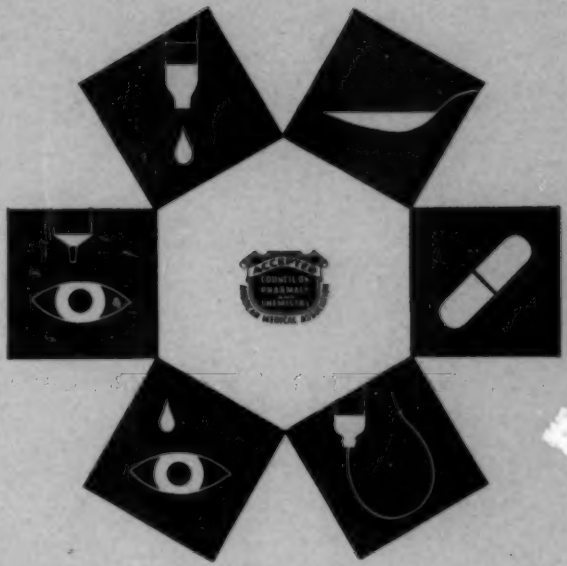
Back issues ..... **$1.00 per copy**
Special issues (December, 1949) ..... **$2.00 per copy**

Jay Arthur Myers, M.D., F.C.C.P., Chairman, Editorial Board.

Terramycin



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*TEMPEL, C. W., FREDERIC, J. H. Jr., MARDIS, R. C., TOWBIN, M. N., and DYE, W. E. Combined intermittent regimens employing streptomycin and PAS, Am. Rev. Tuberc., 1951, 63, 295

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